Letter of Transmittal Management 350 Eagleview Blvd. **DATE:** 3/1/2011 WO NUMBER: 0042525 Suite 200 TO: ATTENTION: Exton, PA 19341 (610) 524-3500 U.S. EPA Region III Mr. Will Geiger (610) 524-7798 (fax) 1650 Arch Street Philadelphia, PA 19103 ORIGINAL **DELIVERY METHOD:** ☐ Electronic Mail Express Mail US Mail Courier ☐ Fax Other WE ARE SENDING YOU: Under separate cover via: ☐ Shop drawings ☐ Prints Plans Samples ☐ Specifications Copy of letter Change order other: Remedial Design Work Plan Submittal **COPIES** DATE NO. DESCRIPTION 3 to EPA 3/1/11 Remedial Design Work Plan (Binder) with Response to 2 to PADEP Comments Letter 1 to EPA 3/1/11 Remedial Design Work Plan (Compact Disc) 1 to PADEP THESE ARE TRANSMITTED AS CHECKED BELOW ☐ Approved as submitted Resubmit ___ copies for approval For your use Approved as noted Submit ___ copies for distribution As requested Returned for corrections Returned ___ corrected prints For review and comment Prints returned after loan to us Per Contract (Paragraphs 11 and 36 of (other) Consent Decree) For bids due ____ REMARKS Will, Enclosed are copies (3 to EPA, 2 to PADEP) of the revised Remedial Design Work Plan (RDWP) for the North Penn Area 2 Superfund Site in Hatfield Township, Pennsylvania. Also enclosed is a copy of the RDWP on compact disc (1 to EPA, 1 to PADEP). If you have any questions or comments, please feel free to contact us. COPY TO: SIGNED: D. Armstrong (PADEP) T. Deeney (AMETEK) M. Berg (M. Berg, Esq. LLC) W. Ponticello (Penn E&R)

Environmental Resources

ERM)

AMETEK, Inc. and Penn Color, Inc.

Remedial Design Work Plan

North Penn Area 2 Superfund Site Hatfield Township, Pennsylvania

12 November 2010

0042525

Environmental Resources Management, Inc. 350 Eagleview Boulevard, Suite 200 Exton, Pennsylvania 19341



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North Penn Area 2 Superfund Site Hatfield Township, Pennsylvania

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Environmental Resources Management, Inc. 350 Eagleview Boulevard, Suite 200

Exton, Pennsylvania 19341

Signature Page

In accordance with Paragraph 37 of the Consent Decree, this Remedial Design Work Plan is signed by the following Daty Authorized Representative of the Settling Defendants.

FOR AMETEK, INC.

Thomas A. Deeney

Vice President for Corporate Compliance and Auditing

AMETEK, Inc.

Signature: Phomas & Decemy Date: 11/10/2010

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Section 1

1.0 INTRODUCTION

1.1 PURPOSE OF DOCUMENT

This Remedial Design Work Plan (RDWP) for Operable Unit #2 (OU-2) at the North Penn Area 2 Superfund Site (Site) in Hatfield Township, Montgomery County, Pennsylvania has been prepared by Environmental Resources Management, Inc. (ERM) on behalf of AMETEK, Inc. (AMETEK) and Penn Color, Inc. (Penn Color), referred to herein as the Settling Defendants.

The selected remedy for the Site is set forth in the Record of Decision (ROD) issued by the United States Environmental Protection Agency (EPA) in April 2009. This RDWP has been prepared as required pursuant to Section VI, Paragraph 6.1(c) of the Administrative Settlement Agreement and Order on Consent for Remedial Design, EPA Docket No. CERC 03-2010-0289 DC with effective date of 30 September 2010, which incorporates by reference Section VI, Paragraph 11b of the Consent Decree (Consent Decree) executed between the Settling Defendants and the United States of America and expected to be lodged in the near future.

1.2 SITE LOCATION AND DESCRIPTION

As originally listed, the North Penn Area 2 Superfund Site was comprised of eight properties totaling approximately 330 acres. The Remedial Investigation (RI) indicated that the 87-acre Penn Color (former AMETEK) facility had contamination that affected groundwater. This RDWP and the proposed remedy address the contamination at the former AMETEK facility.

The Site is an area of approximately 87 acres located at the intersection of Bergey Road and Richmond Road in Hatfield Township, Montgomery County, Pennsylvania. A Site Location Map is presented on Figure 1. A summary of the Site history and enforcement activities is provided in Section 2.0 of the ROD. Groundwater is contaminated with volatile organic compounds (VOCs), one semi-volatile organic compound (SVOC), and metals. Wetland soils at the Site are contaminated with metals, including arsenic, cadmium, chromium, lead, and zinc. Surface soils are contaminated with VOCs and metals. The Site was listed on the National Priorities List (NPL), on October 4, 1989, in part because of the discovery

in 1986 of VOCs in drinking water supply wells operated in the area by the North Penn Water Authority (NPWA). The Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) identification number for this Site is PAD002342475.

The EPA is the lead agency for Site activities and the Pennsylvania Department of Environmental Protection (PADEP) is the support agency. EPA has reached prior settlements with potentially responsible parties (PRPs) under which some of the PRPs performed the Remedial Investigations and EPA investigated the other properties. The Settling Defendants performed the RI (ERM 2005) and Feasibility Study (FS, ERM 2006) at OU-2 pursuant to an administrative order on consent with EPA. The proposed remedy addresses contamination in the groundwater, wetland soils, and surface soils at the Site in the areas designated on Figure 2. The locations of the wells associated with the remedial design are presented on Figure 3. The ROD-selected remedy will comprise a comprehensive remedy for the Site and no further actions are anticipated after Remedial Action (RA) implementation.

1.3 NATURE AND EXTENT OF CONTAMINATION

During the RI process, samples were collected from groundwater, surface water, sediment, surface soils, and wetland soils. Section 1.2.3 of the FS and Section 5.0 of the ROD provide a summary of the RI process and the nature and extent of contamination. A brief description of the types of samples collected and a summary of the results by media are presented below.

1.3.1 Groundwater

Groundwater beneath a portion of the Site is contaminated with chlorinated VOCs, primarily TCE, 1,1,1-trichloroethane, trichlorofluoromethane, and associated solvent constituents. Extensive investigations were conducted to determine the nature and extent of that contamination. The groundwater investigations included installation of additional monitoring wells, packer testing, investigation for dense non-aqueous phase liquid (DNAPL), and pump tests to further evaluate the extent of groundwater contamination attributable to the Site. The RI presents a detailed description of the work performed, evaluation of the data, and interpretation of the results. A summary of the extent of groundwater contamination is presented below.

During the RI, monitoring wells at the Site were sampled in 1995 for TCL VOCs and TAL total and dissolved metals, in 1996 and 2000/2001 for TCL VOCs, and in 2003 for TCL VOCs and 1,4-dioxane, a common stabilizing agent for TCA. With the exception of antimony (15.7 micrograms per liter [ug/l]) and thallium (14.6 ug/l) in MW-6, no significant metals contamination was observed in monitoring wells. VOC results from 1995 and 1996 showed the VOC contamination consisting primarily of TCE; 1,1,1-TCA; and 1,1-DCE with lesser concentrations of PCE; 1,2-DCE; 1,2-DCA; and trichlorofluoromethane. The highest VOC concentrations were detected in MW-2 (up to 31,417 ug/l total VOCs) and MW-3 (up to 9,102 ug/l total VOCs) in shallow bedrock wells. Deep bedrock wells at the MW-3 cluster showed total VOCs up to 11,342 ug/l during these sampling events. Sample results indicated that the groundwater contamination plume did not extend beyond the boundaries of the Site and was likely controlled by pumping of the on-Site production wells.

Further evaluation of the nature and extent of groundwater contamination was then performed and included installation and sampling of 14 additional monitoring wells, retrofitting of several existing wells, sampling of new wells and other selected perimeter and interior wells, geophysical logging, packer testing, and pumping tests.

Results from the 2000/2001 investigation showed the highest levels of total VOCs in well clusters MW-2 (4,145 ug/l to 17,628 ug/l total VOCs) and MW-3 (247 ug/l to 2520 ug/l total VOCs) with the plume extending in a southeasterly direction towards cluster MW-5, which also showed elevated VOCs (7 ug/l to 571 ug/l total VOCs). Perimeter wells located along the groundwater flow path downgradient of MW-5, such as clusters MW-9, MW-13, and MW-14, did not show any levels of VOCs indicating the plume is likely contained within the property boundaries. The highest levels of individual VOCs on-Site were detected in MW-2I (TCE up to 6,600 ug/l; PCE up to 680 ug/l; 1,1-DCE up to 3,800 ug/l).

None of the sampled off-Site wells, including residential wells, contained site-related VOCs, with the exception of well M-6. Well M-6 was located down-gradient and off-Site just outside the Site property line and on the former Eastern Prestressed Concrete (EPC) property. During the 2000/2001 sampling round, TCE and DCE were detected at a level below MCLs. However, since previous samples were slightly above MCLs, EPA could not conclude that the well is not currently contaminated. Therefore, the ROD requires that M-6 be included in the monitoring program for evaluating the performance of the groundwater remediation. In 2010, EPA reported that its subcontractor had observed that M-6 was removed.

A subset of monitoring wells were sampled and analyzed for 1,4-dioxane in 2003 because 1,4-dioxane was used as a stabilizer for 1,1,1-trichloroethane, which as discussed above, was discovered at elevated levels in groundwater at the Site. 1,4-dioxane was detected at MW-2S at 480 ug/L, MW-2D at 8 ug/L, MW-3A at 69 ug/L, MW-3D and MW-5D at 47 ug/L, MW-5S at 5 ug/L, MW-5I at 18 ug/L, and PW-3 as high as 96 ug/L.

In 2008, EPA sampled a number of on-Site and off-Site wells in preparation for issuing the ROD. The results of this sampling were similar to previous results with elevated VOC contamination in on-Site wells and no detection of contamination in the perimeter well or off-Site residential wells. The on-Site results indicated the groundwater plume configuration was unchanged, but concentrations over time have been reduced, likely due to the ongoing groundwater pumping efforts.

The vertical extent of the plume extends to the deepest zones where groundwater is present. Packer tests indicate no measurable yields at depths of approximately 450 to 500 feet. It appears that fractures below this depth are not impacted above levels of concern (i.e., drinking water standards) and are not likely interconnected with the shallower contaminated zones. An investigation for free-phase solvent product or DNAPL was also conducted in wells closest to the suspected release point and none was detected.

Currently, the contaminated groundwater is being contained and removed on-Site through the pumping of production well PW-3, at an average rate of approximately 20,000 gallons per day. This production well was installed during the RI as an Interim Remedial Measure to replace the existing production wells that were previously used, in order to better capture the affected groundwater. Groundwater that is pumped from well PW-3 is used by the Site's current owner, Penn Color, for non-contact cooling water, then discharged to the Hatfield Township Municipal Authority (HTMA) sewer system for treatment at HTMA's publicly owned treatment works (POTW) in Colmar.

1.3.2 Surface Water and Sediment

Surface water and sediment samples were collected from three stations in the tributary to Neshaminy Creek in 1995, 1996, and 2000. In 1996, TCE was detected in one surface water sample at the downstream location (SW-1) at 2 ug/L, which is below the MCL. No other VOCs were detected in any of the surface water samples. Sample analysis for TAL metals and TCL SVOCs did not show significant contamination. Sediment

samples showed low levels of TCE, 1,1,1-TCA, and PCE in the downstream location during the 1996 sampling event. These detections may have been attributable to shallow groundwater discharge to the tributary. No significant contamination by metals or SVOCs was observed in sediments.

1.3.3 Wetland Soils

Soil samples were collected from the wetland area between the manufacturing building and tributary in 1994. Evaluation of the samples indicated the presence of elevated levels of metals, including arsenic, cadmium, chromium, lead, and zinc. Additional assessment of this area was required to evaluate potential ecological risks leading to further sampling in 2000 and 2001. Comparisons to background and to EPA benchmarks indicated that cadmium contamination (up to 1,030 mg/kg) was a concern in the wetland soils area along with the other referenced metals. Other contaminants, most notably SVOCs, were detected, but may be attributable to runoff from roadways. The levels of SVOCs present did not exceed EPA screening benchmarks. Additional sampling was conducted in the wetland in 2004 to better delineate the potential wetland remediation area. Sample locations from the wetland soils investigation and the delineated area of principal impact are shown on Figure 2.

1.3.4 Surface Soils

Surface Soils Investigation

A soil investigation was conducted at the Site in 1994. A total of 90 soil borings were drilled in and around the various source areas. Analysis was for Target Compound List (TCL) VOCs, semi-volatile organic compounds (SVOCs), pesticides/PCBs, and Target Analyte List (TAL) metals and cyanide. Samples were also analyzed in the field using gas chromatograph/mass spectrometer (GC/MS) for VOCs, SVOCs, and metals analysis. A summary of results for each area investigated is presented in Section 1.2.3 of the FS and Section 5.0 of the ROD, and is not restated here. Figure 2 shows the locations of the soil borings that were advanced within and near the areas to be addressed by the RA.

Soil Removal

ERM

In 1987, soil from three on-Site areas was excavated and remediated. The approximate locations of these areas are shown on Figure 3 of the ROD and are labeled as Former TCE Tank Area, Former Paint Storage Area,

and Disturbed Excavation Area. The excavated soil was treated on-Site and then placed in a berm on-Site (shown as Soil Berm on Figure 3 of the ROD). Approximate excavation amounts for the three areas are 557 cubic yards from the Former TCE Tank Area, 61 cubic yards from the Former Paint Storage Area, and approximately 534 cubic yards from the Disturbed Excavation Area.

Based on the results of the 1994 soil investigation, in 1995 cadmium-contaminated soils were excavated to a clean-up standard of 510 mg/kg. Over 2,400 tons of soil were removed and disposed at an off-Site facility. During these activities, three sumps and underground pipes that were part of the AMETEK plant's wastewater treatment facility were encountered. VOCs were detected in soil samples taken below these features and included: PCE (up to 46,438 micrograms per kilogram [ug/kg]); TCE (up to 1,430 ug/kg); 1,2-DCE (up to 1,850 ug/kg); vinyl chloride (up to 348 ug/kg); 1,1-DCE (up to 17 ug/kg); 1,1-DCA (up to 9 ug/kg); and 1,1,1-TCE (up to 10 ug/kg). The sumps, sump contents, portions of the pipes, and soils underlying these features were removed. The pipe left in place was flushed and sealed with grout. The remnants of the system are now covered by Penn Color's manufacturing buildings.

Current Soils Status

During the FS, results of confirmation sampling of remaining surface soils after the 1995 soil removal program were compared to current EPA soil screening levels (SSLs) and EPA Region 3 Risk Based Concentration (RBC) benchmarks. In addition, subsurface soils that were not subject to excavation were also evaluated. The results of this evaluation indicated that arsenic, manganese, TCE, and PCE are present at levels above SSLs and/or RBCs at various locations on the Site. These locations are shown on Figure 14 of the ROD. Statistical comparisons to background were conducted for the metals. Results indicate that manganese concentrations on-Site are within the range of background levels and the majority of locations with arsenic greater than EPA benchmarks were within background levels. The four remaining locations that require active remediation pursuant to the ROD are shown on Figure 2.

1.3 RDWP ORGANIZATION AND CONTENTS

In accordance with the Consent Decree (Paragraphs 11.a. and 11.b. i.-vii.), the RDWP includes the following.

• Health and Safety Plan (HASP) for field design activities;

- Remedial Design Site Management Plan (SMP);
- Remedial Design Sampling and Analysis Plan (SAP), containing a Field Sampling Plan (FSP) and a Quality Assurance Project Plan (QAPP);
- Remedial Design Contingency Plan included herein as Section 6;
- Remedial Design schedule; and
- plans and schedules for the preparation and submission of all necessary remedial pre-design and design tasks.

This RDWP contains the requisite elements listed above and is organized as follows.

Section 2 – Summary of the Selected Remedy. Describes remedial action objectives (RAOs), performance standards, and applicable or relevant and appropriate requirements (ARARs), and presents the remedial components.

Section 3 – Remedial Design Delivery Strategy. Provides the remedial design stages and deliverables, including the preliminary, pre-final, and final design tasks, and discusses access/easements, permitting and approvals, and the remedial design schedule.

Section 4 - *Pre-Design Investigation Scope of Work.* Provides a description of the scope of work for the pre-design investigation activities.

Section 5 - Development of Remedy Elements. Presents the approach for developing and designing the primary remedial components and discusses the Remedial Action (RA) implementation plans and schedule.

Section 6 – Remedial Design Contingency Plan. Identifies major design elements that may require modification as the RD progresses, and identifies potential impacts to the RD and the plans for mitigating the potential impacts.

Appendix A – Remedial Design / Draft Remedial Action Health and Safety Plan. Provides the health and safety requirements for the field activities.

Appendix B – *Remedial Design Site Management Plan.* Addresses the following on-Site items: health and safety; communications, access, and security; support facilities; waste management; and emergency response and spill control.

Appendix C – Remedial Design Sampling and Analysis Plan. Provides the sampling and analysis procedures and requirements associated with the remedial design activities.

Section 2

2.0 SUMMARY OF THE SELECTED REMEDY

This section presents the remedial action objectives (RAOs), performance standards, and applicable or relevant and appropriate requirements (ARARs) for the remedy and a summary of remedial components.

2.1 REMEDIAL ACTION OBJECTIVES

The RAOs are provided in Section 8.0 of the ROD and are listed below:

- Protect human health for current and future industrial Site use;
- Prevent exposure of human or ecological populations to contaminated media that would result in unacceptable levels of risk;
- Prevent or minimize further migration of the groundwater plume (source control);
- Mitigate further releases of hazardous substances to groundwater;
- Prevent or minimize contaminant migration from wetland soils to surface water (source control);
- Prevent or minimize contaminant migration from soils to groundwater (source control);
- Ensure buildings and pavements continue to protect groundwater from potential soil-to-groundwater contaminant migration;
- Restore groundwater throughout the plume to drinking water standards (aquifer restoration); and
- Restore forested wetland and surface soil areas if disturbed by cleanup.

The ROD states that in order to achieve the RAOs for groundwater, the remedy should:

 Remediate contaminated groundwater until the groundwater cleanup levels are attained;

- Remove contaminated soils to prevent migration of contamination;
- Restrict on-Site groundwater use until the groundwater cleanup levels are attained.

2.2 PERFORMANCE STANDARDS

Section 11.2 of the ROD specifies performance standards for the remedy elements. The elements and their performance standards are summarized below.

2.2.1 Groundwater Recovery

Groundwater recovery will prevent the migration of contaminated groundwater while reducing the volume of contaminated materials in groundwater in order to restore groundwater to beneficial use. Performance standards for the groundwater collection system are provided below.

- Prevent the migration of contaminated groundwater from the Site through the installation, operation, and maintenance of a groundwater collection (e.g., pumping) and treatment (e.g., conveying to the Publicly Owned Treatment Works) system.
- Monitor pumping rates and static water levels to assure maintenance of hydraulic control over the contaminant plume.
- Operate and maintain the groundwater collection system until the groundwater cleanup levels (see Table 1, based on Table 20 of the ROD) have been achieved. The system shall continue to operate until the Maximum Contaminant Levels (MCLs) are attained and the excess cancer risk associated with potential residential use of the groundwater is reduced to one in ten thousand (1.0 X 10-4) or less and the Hazard Index (HI) is reduced to 1.0 or less for a period of three consecutive years. EPA shall determine when these conditions have been met.
- When pumping at the Site is discontinued, the intermittent tributary to the West Branch of the Neshaminy Creek should be evaluated to ensure that any groundwater discharging from the Site does not cause the intermittent tributary to exceed the Pennsylvania Water Quality Criteria for Toxics. If the criteria are

exceeded under non-pumping conditions, EPA shall determine any additional actions that are required to comply with this ARAR.

2.2.2 Groundwater Treatment as Necessary to Meet Discharge Requirements

Collected groundwater shall be treated, if necessary, to achieve the National Pollutant Discharge Elimination System (NPDES) Pretreatment requirement established by HTMA's POTW. The groundwater shall be discharged to the sanitary sewer collection system for aerobic biological treatment at the POTW. Performance standards for the groundwater pretreatment and discharge are provided below.

- 1. The discharging of groundwater shall be coordinated with HTMA's POTW to ensure the discharge can be accepted by the POTW. The POTW will evaluate both flow and contaminant levels to ensure the plant has sufficient capacity for the discharge.
- 2. In the event that HTMA's POTW cannot accept the discharge, appropriate measures must be taken in order to contain, recover, and treat the contaminated groundwater.
- 3. Piping to the sanitary sewer tie-in shall be properly inspected and maintained in order to ensure the discharge is being treated at the POTW.
- 4. Monitoring reports shall be submitted to EPA semiannually and in such detail to allow EPA to determine whether or not the groundwater treatment systems are in compliance with the ROD and, in particular, whether performance standards 1 through 3 above have been achieved and are being maintained.

2.2.3 Wetland Soils Excavation and Off-Site Disposal

The selected remedy for wetland soils will prevent ecological contact, migration of contamination by erosion, and infiltration to groundwater. Contaminated wetland soils will be excavated and properly disposed off-Site. Performance standards for wetland soils excavation are provided below.

1. Soils exceeding cleanup criteria (see Table 2, based on Table 21 of the ROD), as delineated in the RI, shall be excavated. EPA will tag trees to remain in place.

- 2. Implement sediment erosion controls in accordance with 25 PA Code §102.11, 102.22.
- 3. In areas lying within the boundary delineated in the RI (see RD Drawing 1), excavate all soils to a depth of 2 feet or to bedrock, whichever is less.
- 4. On-Site handling of hazardous waste and solid waste shall be in accordance with ARARs.
- 5. Properly handle and dispose of contaminated soil at a permitted off-Site facility, in compliance with the permitting and other requirements of the Resource Conservation and Recovery Act (RCRA) and applicable state hazardous waste <u>regulations</u>. Off-Site disposal and handling shall be in accordance with State and Federal laws and regulations, as set forth in Section 121(d)(3) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and 40 Code of Federal Regulations (C.F.R.) § 300.440.
- 6. Any air emissions during wetland excavation and grading activities shall comply with the substantive requirements of PADEP Fugitive Emissions 25 PA Code §123.1-.2.
- 7. All excavation activities that will affect wetlands, floodplains, or waters of the United States shall be conducted in accordance with the substantive requirements of Federal Regulation of Activities in or Affecting Wetlands/Floodplains, 40 C.F.R. § 6.302(a) and (b).
- 8. Roads or other means of access constructed for the purpose of excavating soils shall be constructed in a manner to minimize disturbance to wetlands.

2.2.4 Wetland Area Targeted Backfilling and Restoration

The wetland area shall be restored in order to repopulate the area quickly and minimize the impact to the wetland. Performance standards for restoring disturbed wetland area are provided below.

- 1. Hand grade shallow wetland depressions of 12-18 inches in depth with gradual slopes.
- 2. Plant the area with native wetland or floodplain seed mix, including a nurse crop for immediate cover.

- 3. Plant the periphery of each depression with native shrubs.
- 4. All excavation activities that will affect wetlands, floodplains, or waters of the United States shall be conducted in accordance with the substantive requirements of Federal Regulation of Activities in or Affecting Wetlands/Floodplains, 40 C.F.R. § 6.302(a) and (b).

2.2.5 Surface Soils Excavation and Off-Site Disposal

The selected remedy for surface soils will prevent dermal contact, migration of contamination by erosion, and infiltration to groundwater. Contaminated surface soils will be excavated and properly disposed off-Site. Performance standards for excavating contaminated surface soils are provided below.

- 1. Soils exceeding cleanup criteria (see Table 3, based on Table 22 of the ROD) shall be excavated.
- 2. Implement sediment erosion controls in accordance with 25 PA Code §102.11, 102.22.
- 3. In areas lying within the boundary delineated in the RI (see Figure 2), excavate soils until post-excavation sampling shows that cleanup levels are achieved or until additional shoring would be needed to protect the structural integrity of existing buildings.
- 4. On-Site handling of hazardous waste and solid waste shall be in accordance with ARARs.
- 5. Properly handle and dispose of contaminated soil at a permitted off-Site facility, in compliance with the permitting and other requirements of RCRA and applicable state hazardous waste regulations. Off-Site disposal and handling shall be in accordance with State and Federal laws and regulations, as set forth in Section 121(d)(3) of CERCLA and 40 C.F.R. § 300.440.
- 6. Any air emissions during soil excavation and grading activities shall comply with the substantive requirements of PADEP Fugitive Emissions 25 PA Code § 123.1-.2.

2.2.6 Surface Soils Area Backfilling and Restoration

The excavated surface soils areas will be backfilled and reseeded to preexcavation conditions. Performance standards for restoring the excavated surface soils areas are provided below.

- 1. Backfill the excavated areas to existing grade.
- 2. Restore the area with appropriate vegetation as to mitigate erosion.

2.2.7 Groundwater, Wetland Soils, and Surface Soils Monitoring

Groundwater, wetland soils areas, and surface soils areas will be monitored to ensure the protectiveness of the remedy. Performance standards for this monitoring are provided below.

- 1. Monitor groundwater semi-annually to ensure containment has been achieved and to assess the progress of the remedy in reducing the concentrations of COCs.
- 2. Monitor wetland area semi-annually for the first five years after the work is completed to ensure restoration of the disturbed area.
- 3. Monitor surface soil area annually for the first five years after the work is completed to ensure restoration of the disturbed areas.

2.2.8 Institutional Controls

An Institutional Control Assurance Plan shall be implemented to address institutional controls, including land and groundwater use restrictions, for the Site. The purpose of the institutional controls shall be to prevent exposure to unacceptable risks associated with remaining Site-related contaminants and to protect the components of the selected remedy. At a minimum, institutional controls will be implemented to protect the integrity of the remedy, to prevent exposure to contaminated groundwater and soils, and to restrict the future use of the Site to industrial purposes. A status report on such institutional controls shall be prepared and submitted for EPA's review six months prior to each scheduled five-year statutory review, unless EPA approves an alternate schedule. Performance standards for land and groundwater use restrictions for the Site are provided below.

1. Prohibit interference with groundwater recovery and piping to the treatment system. Any activity or use that could interfere with the

operation of the groundwater recovery or treatment system, such as excavation, construction within the area of the treatment system, or pumping that affects recovery of contaminated groundwater shall be prohibited.

- 2. Prohibit interference with the structure and function of restored wetlands. Any activity that could interfere with the structure and function of restored wetlands at the Site shall be prohibited.
- 3. Prohibit exposure to contaminated groundwater. Use and/or contact with contaminated groundwater at the Site, via ingestion, vapor inhalation, or dermal contact shall be prohibited to avoid unacceptable exposure to contaminants in groundwater.
- 4. Maintain and protect the integrity of the existing buildings and pavement as they currently prevent direct contact and minimize infiltration through contaminated soil. Any modifications to the existing buildings or impervious surfaces shall be done in such a way as to prevent direct contact and minimize infiltration through contaminated soil.
- 5. Restrict future land use to commercial/industrial purposes.
- Ensure proper indoor air monitoring and mitigation in the event the facility use is changed and is not covered by Occupational Safety and Health Administration (OSHA).

2.3 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

CERCLA requires remedial actions at National Priorities List (NPL) sites to meet the ARARs under federal or state environmental laws and regulations. For on-site work, CERCLA actions do not require a permit; however, substantive requirements of the ARARs need to be met.

Section 12.2 of the ROD presents the federal and state ARARs identified for the Site. The selected remedy presented in the ROD was developed to comply with the substantive requirements of these ARARs. This section summarizes the primary chemical-, location-, and action-specific ARARs that directly apply to the Site.

2.3.1 Chemical-Specific ARARs

Chemical-specific ARARs are health- or risk-based numerical values or requirements that establish acceptable limits or concentrations of a contaminant, or a basis for calculating such limits. The chemical-specific ARARs that will affect the Site remedial activities include the following.

- National Primary Drinking Water Standards (40 C.F.R. §§ 141.50-51, 141.61-62) The primary standards include Maximum Contaminant Levels (MCLs) that are enforceable standards for specific contaminants. The cleanup levels, based primarily on the MCLs, for the contaminants of concern in groundwater at the Site are set forth in Table 20 of the ROD and Table 1 herein. The groundwater remedy will achieve compliance with these cleanup levels.
- Pennsylvania Land Recycling and Environmental Remediation Standards Act (Act 2; 25 Pa. Code Ch. 250, Appendix A, Tables 3 and 4) – The Act 2 statewide health standards for contaminants in soil were considered in the development of the cleanup levels for wetland soil and surface soil at the Site. The cleanup levels for wetland soil are presented in Table 21 of the ROD and Table 2 herein. The cleanup levels for surface soil are presented in Table 22 of the ROD and Table 3 herein. The wetland soils and surface soils remedies will achieve compliance with these cleanup levels.
- Pennsylvania Water Quality Criteria for Toxics (25 Pa. Code Ch. 16, Appendix A, Table 1) The remedy will incorporate measures to assure that these standards are maintained in the intermittent tributary to the West Branch of the Neshaminy Creek. During active groundwater remediation, these measures will include water level analysis to assess groundwater capture and stream sampling to check quality. If groundwater pumping at the Site is discontinued due to meeting groundwater criteria, the tributary will be evaluated to ensure that any groundwater discharging from the Site does not cause the tributary to exceed the surface water quality criteria for toxic substances. If the criteria are exceeded under non-pumping conditions, EPA will determine any additional actions that are required to comply with this ARAR.

2.3.2 Action-Specific ARARs

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Action-specific ARARs are usually activity- or technology-based requirements on actions or conditions involving specific substances, such

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as remediation waste. The action-specific ARARs that will affect the Site remedial activities include the following.

- Pretreatment Standards for Discharges to POTWs (40 C.F.R. §
 403.5) The recovered groundwater will be monitored
 semiannually to ensure that contaminants in the water are at
 acceptable concentrations prior to being discharged to the HTMA's
 POTW. Monitoring reports will be submitted to EPA semiannually
 and in such detail to allow EPA to evaluate compliance with this
 ARAR.
- The Pennsylvania Erosion and Sediment Control Regulations (25
 Pa. Code §§ 102.4(b), 102.11, 102.22) Appropriate soil erosion and
 sediment controls will be utilized during remedial activities that
 involve disturbance of the land (e.g., clearing, grading, excavation).
- The Pennsylvania Stormwater Management Act (32 P.S. § 680.13) Appropriate storm water management controls will be utilized during remedial activities.
- Fugitive Emissions Regulations (25 Pa. Code §§ 123.1-2) –
 Excavation activities that may result in dust or particulate matter emissions will comply with these requirements.
- Pennsylvania Hazardous Waste Management Regulations (25 Pa. Code § 264a.1, which incorporates 40 C.F.R. § 264.554(d), (g), (h), (j), and (k)) Temporary storage of excavated contaminated material prior to shipment off-Site will comply with these requirements.

2.3.3 Location-Specific ARARs

Location-specific ARARs consist of restrictions placed on the conduct of activities because they occur in a specific location, such as wetlands or floodplains. The location-specific ARARs that will affect the Site remedial activities include the following.

- Groundwater Withdrawal Regulations (18 C.F.R. §§ 430.7, 430.9, 430.(i)(3)(i), 430.15(b)) Wells utilized for groundwater recovery during remedial activities will comply with these requirements.
- EPA Memorandum of Agreement with Delaware River Basin Commission (DRBC) (incorporated as federal standards through 18 C.F.R. § 410.1) Wells utilized for groundwater recovery during remedial activities will comply with these requirements.

- Regulations Governing Activities Impacting Wetlands and Undertaken in Floodplains (40 C.F.R. § 6.302(a) and (b) and Part 6, Appendix A; 25 Pa. Code § 105.18a) – The remedial excavation and restoration activities in wetland and floodplain areas will comply with these state and federal regulations and are designed to avoid and minimize adverse impacts to wetlands and floodplains to the extent practicable.
- Regulations Governing Fish and Wildlife Protection (40 C.F.R. § 6.302(g)) The remedial activities in the wetland area will comply with these requirements and will minimize impacts to fish and wildlife to the extent practicable. Activities are not anticipated to occur within the channel of the intermittent tributary to the West Branch of the Neshaminy Creek.

2.3.4 To Be Considered

In addition to the ARARs, Section 12.2 of the ROD includes the following items to be considered during the RD.

- Risk Assessment Guidance for Superfund The risk assessment process prescribed by this Guidance provides estimated risks for constituents where no cleanup standard or ARAR exists. Specific to this Site, certain groundwater contaminants were found to exceed established risk thresholds and therefore cleanup standards were established. The remedy will comply with these standards.
- Pretreatment Standards for Discharges to POTWs (18 C.F.R. §§ 430.11, 430.13(d) & (k), 430.21) These standards, which govern the withdrawal of water from new or expanded wells in the Delaware River Basin, will be considered as needed for future changes to the groundwater remedy.
- Executive Order 11988 Floodplains Management The
 requirements of this Order, which considers the impacts of federal
 agency actions to floodplains, were considered during the design of
 the wetland area remedy. The remedial excavation and restoration
 activities floodplain areas are designed to avoid and minimize
 adverse impacts to floodplains to the extent practicable.
- Executive Order 11990 Protection of Wetlands The requirements
 of this Order, which requires federal agencies to take action to
 minimize the destruction, loss, or degradation of wetlands in
 carrying out the agency's responsibilities, were considered during

the design of the wetland area remedy. The remedial excavation and restoration activities in wetland areas are designed to avoid and minimize adverse impacts to wetlands to the extent practicable.

2.4 REMEDIAL COMPONENTS

The selected remedy, as presented in Section 11.2 of the ROD, consists of the following major elements.

- 1. Actively recovering contaminated groundwater to achieve aquifer restoration. Removal rates and pumping configurations will be finalized during the RD.
- 2. Discharging contaminated groundwater to the POTW for aerobic biological treatment.
- 3. Excavating and properly disposing off-Site approximately 1,175 cubic yards of contaminated wetland soils, while preserving mature trees.
- 4. Restoring disturbed wetland area with grasses and shrubs.
- 5. Excavating and properly disposing approximately 370 cubic yards of contaminated surface soils.
- 6. Backfilling the excavated surface soil area and planting appropriate vegetation.
- 7. Monitoring groundwater and wetland area to ensure the effectiveness of the remedy.
- 8. Implementing institutional controls that run with the land, such as a covenant, to protect the integrity of the remedy, to prevent exposure to contaminated groundwater and soils, and to restrict the future use of the Site to industrial purposes.

The development and design of these remedial components is described in Section 5.

Section 3

3.0 REMEDIAL DESIGN DELIVERY STRATEGY

The remedial design process will consist of pre-design investigations and the preparation of the design. The pre-design investigation scope of work is discussed in Section 4, and the design stages and deliverables are discussed below.

3.1 DESIGN STAGES AND DELIVERABLES

According to Paragraphs 11.b. v-vii of the Consent Decree, the RD stages and deliverables include the Preliminary Design (approximately 50 percent), the Pre-Final Design (approximately 90 percent), and the Final Design (100 percent), as described below.

This RDWP includes a RD Contingency Plan in Section 6.

3.1.1 Preliminary Design

Consistent with Paragraph 11.b.v of the Consent Decree, the Preliminary Design deliverables will include at a minimum the following components [with corresponding Consent Decree paragraph noted]:

- a Design Criteria Report, including project description, design requirements and provisions, preliminary process flow diagrams, and operation and maintenance requirements [Paragraph 11.b.v.a];
- a Basis of Design Report, including justification of design assumptions, a project delivery strategy, remedial action permits plan for off-site permits, and preliminary easement/access requirements [Paragraph 11.b.v.b];
- Preliminary Drawings, including preliminary schematics and drawings [Paragraph 11.b.v.c];
- Preliminary Specifications, including the outline of general specifications [Paragraph 11.b.v.c];
- results of pre-design investigation work, such as pertinent chemical and geotechnical data, as available [Paragraph 11.b.v.c];
- a preliminary Remedial Action schedule [Paragraph 11.b.v.d];
- a preliminary Remedial Action contingency plan [Paragraph 11.b.v.e];

- a preliminary Remedial Action Health and Safety Plan [Paragraph 11.b.v.f];
- a preliminary Remedial Action waste management plan [Paragraph 11.b.v.g]; and
- a preliminary Remedial Action Sampling and Analysis Plan [Paragraph 11.b.v.h];

3.1.2 Pre-Final Design

The Pre-Final Design will address EPA's comments on the Preliminary Design and will additionally include, at an approximately 90-percent complete stage, at a minimum the following components [with corresponding Consent Decree paragraph noted]:

- a revised Design Criteria Report, if necessary [Paragraph 11.b.vi.a];
- a revised Basis of Design Report, if necessary [Paragraph 11.b.vi.b];
- a preliminary Operation and Maintenance Plan [Paragraph 11.b.vi.c];
- a preliminary Construction Quality Assurance Plan (CQAP) [Paragraph 11.b.vi.d];
- a preliminary Remedial Action decontamination plan [Paragraph 11.b.vi.e];
- draft final Drawings [Paragraph 11.b.vi.f];
- draft final Specifications [Paragraph 11.b.vi.f];
- a draft final Remedial Action schedule [Paragraph 11.b.vi.g];
- a draft final Remedial Action contingency plan [Paragraph 11.b.vi.h];
 and
- a draft final Remedial Action Health and Safety Plan [Paragraph 11.b.vi.i].

3.1.3 Final Design

The Final Design will address EPA's comments on the Pre-Final Design and will additionally include at a minimum the following components [with corresponding Consent Decree paragraph noted]:

- a final Remedial Action schedule [Paragraph 11.b.vii.a];
- a final Remedial Action contingency plan [Paragraph 11.b.vii.b];
- a final Remedial Action Health and Safety Plan [Paragraph 11.b.vii.c];

- a final Remedial Action waste management plan [Paragraph 11.b.vii.d];
- a final Design Criteria Report [Paragraph 11.b.vii.e];
- a final Basis of Design Report [Paragraph 11.b.vii.f];
- a final Remedial Action Sampling and Analysis Plan [Paragraph 11.b.vii.g];
- final Drawings [Paragraph 11.b.vii.h];
- final Specifications [Paragraph 11.b.vii.h];
- a revised Operation and Maintenance Plan and a schedule for submission of the final Operation and Maintenance Plan [Paragraph 11.b.vii.i];
- a final Construction Quality Assurance Plan [Paragraph 11.b.vii.j];
- a final Remedial Action decontamination plan [Paragraph 11.b.vii.k];
 and
- a final project delivery strategy [Paragraph 11.b.vii.l].

3.2 ACCESS/EASEMENTS

The Site is currently owned by Penn Color and Site access needs will be coordinated with Penn Color. All locations anticipated to be included in the pre-design investigation or design tasks are located on the Penn Color property and no access agreement or easement is necessary for work associated with those wells or the intermittent stream. However, if the former well M-6 location needs to be accessed, an access agreement or easement will be obtained by the Settling Defendants or the Supervising Contractor.

3.3 PERMITTING AND APPROVALS

As set forth in 40 CFR 121(e) of CERCLA and Section 300.400(e) of the NCP, federal, state, or local permits are not required for remedial actions conducted entirely on-site, although permits may be required for off-site activities. All planned remedial design and remedial action construction activities will occur within the limits of the Site as defined by CERCLA (i.e., the limit of contamination); there are no planned off-Site construction activities. Hence, no environmental permits are needed nor will be applied for to implement the RD and RA. However, compliance with the substantive requirements of applicable or relevant and appropriate

requirements (ARARs) is required. Therefore, to facilitate concurrence from applicable regulatory agencies, permit equivalencies for the RA will be prepared during the RD. No permit equivalencies are needed to perform the RD.

The permit equivalencies needed for the RA include an Erosion and Sediment Control Pollution Plan (County Conservation District) and a Standard Joint Permit Application (PADEP). The scope of these permit equivalencies is presented below. These permit equivalencies will be prepared during the RD.

3.3.1 Erosion and Sediment Pollution Control Plan

In accordance with 25 PA Code Chapter 102, a Soil Erosion and Sediment Control Plan will be developed. The Erosion and Sediment Pollution Control Plan will be implemented during the pertinent portions of the RA (i.e., wetland soils and surface soils excavation) and maintained until all related disturbed areas of the Site have stabilized. The Erosion and Sediment Pollution Control Plan will be provided to the Montgomery County Conservation District for informational purposes.

3.3.2 Standard Joint Permit Application

The wetland area restoration plan that will be prepared during the RD (see Section 5.3 below) will contain the technical approach required in a Standard Joint Permit Application and will be provided to the PADEP as a permit equivalency. The permit equivalency will provide the required substantive technical information to support the excavation and restoration of the regulated areas located within the area of disturbance. The permit equivalency will provide an environmental assessment, hydrologic and hydraulic analysis, and alternatives analysis.

3.4 REMEDIAL DESIGN SCHEDULE

The anticipated schedule for completion of the remedial design and the draft schedule for remedial action is shown in Figure 4. Estimated timeframes to prepare all RD deliverables have been built into the schedule, as well as periods required for EPA comments. The Settling Defendants have elected to advance the design directly to the Pre-Final stage and submit a Pre-Final Design that will satisfy the requirements for the Preliminary Design and the Pre-Final Design. This election is presented on the Remedial Design Schedule.

The Settling Defendants will provide an update on schedule in the monthly progress reports.

A pre-design field investigation will be conducted to gather additional data to support the remedial design. At this time, the wetland and soil elements of the remedy do not require any pre-design field investigation but additional work is planned for groundwater.

EPA has requested that the water level measurements and sampling be conducted to obtain current information and to aid in determining the extent of groundwater capture at the southern end of the study area. During the Remedial Investigation, numerous rounds of groundwater levels and samples were collected under pumped and natural conditions. This included data from 1996, three pump tests from 2000, seven pump tests from 2001 and 2002, and two rounds of data in 2008 with the current groundwater remedial system in place for approximately 7 years.

The investigation will include the following tasks:

- the installation and surveying of three stream level monitoring points (see Figure 3) in the intermittent stream in November 2010;
- a round of water level measurements in all Site wells and the intermittent stream (see Figure 3) in November 2010;
- a round of groundwater sampling from all Site wells and water level measurements in all Site wells and the intermittent stream (see Figure 3) in spring of 2011;
- general Site visits to evaluate work elements as required by the design; and
- any additional Site investigations identified during the course of the Remedial Design process necessary for its completion.

The pre-design investigation tasks will be performed in accordance with the RD HASP included in Appendix A and the RD SAP included in Appendix C. The groundwater sampling procedures, analyses, and other requirements are provided in the RD SAP (Appendix C).

Section 5

5.0 DEVELOPMENT OF REMEDY ELEMENTS

This section discusses the remedy elements that will be developed and discusses the RA implementation plans and schedule. The remedy elements will be designed to achieve the RAOs, performance standards, and ARARs.

5.1 GROUNDWATER RECOVERY AND DISCHARGE FOR TREATMENT

The remedial design will address the following components of the groundwater-recovery and discharge for treatment:

- · pumping configuration and recovery rates,
- discharge to the POTW for treatment, and
- monitoring associated with the recovery and discharge for treatment.

5.1.1 Pumping Configuration and Recovery Rates

The existing groundwater system pumps at approximately 20,000 gallons per day. A capture zone analysis will be performed during the remedial design to determine whether capture of the contaminated groundwater plume is demonstrated and to support the determination of the pumping configuration and recovery rates. As discussed in "A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems" (EPA, 2008), the capture zone analysis will follow the six steps outlined there and evaluate multiple lines of evidence. The capture zone analysis will consist of the following:

- water levels, including past water level data and data from the predesign investigation;
- calculations and groundwater modeling; and
- concentration trends, which will incorporate past data and data from the pre-design investigation.

The deliverable from this work will follow the examples provided in exhibits 8 and 9 of the EPA Approach document and provide the supporting documentation for the conclusions presented. The pumping configuration and recovery rates will be determined based on evaluations of the groundwater recovery system performance (as indicated in the capture zone analysis) and in consideration of the RAOs and performance standards. The results of this work may include a recommendation for

maintaining, increasing, or decreasing pumping with the existing system, or changes to the configuration of the extraction points.

The capture zone analysis will be used to evaluate the need for and function of the former M-6 location as a sentinel point during the RA groundwater monitoring.

5.1.2 Discharge to POTW for Treatment

For the duration of the groundwater recovery pumping, it is anticipated that the recovered groundwater will not require pretreatment and will continue to be discharged to the HTMA's POTW for aerobic biological treatment. During the Remedial Design, the ability of HTMA's POTW to continue handling the recovered water will be reconfirmed. The remedial design will include a Remedial Action Contingency Plan (see Section 5.7.7 below) that will include contingencies in the event the performance standards can no longer be met (e.g., the POTW cannot accept the discharge). These contingencies will likely include either pretreatment before discharge to the POTW or discharge to the unnamed tributary at the Site, similar to the options considered in the FS.

5.1.3 Monitoring

The groundwater portion of the remedial action will include several types of monitoring. The remedial design, including the Operation and Maintenance Plan, will address the following remedial action monitoring requirements:

- pumping rates and static water levels;
- groundwater sampling;
- stream water level elevations;
- surface water sampling; and
- DRBC-required monitoring.

5.2 WETLAND SOILS EXCAVATION AND OFF-SITE DISPOSAL

As discussed in Section 2, the selected remedy requires the excavation of three wetland areas. The remedial design will address the following aspects of the RA wetland soils excavation and off-Site disposal at a permitted landfill.

- Excavation The RD will address the associated temporary support features, excavation limits, tree root zone protection, excavation methods, and water management.
- Excavated material handling and off-Site disposal The RD will address the waste characterization for disposal facility acceptance and the excavated material handling.
- Storm water management and erosion and sediment pollution controls The RD will address the construction-phase and post-construction storm water management and erosion and sediment pollution controls. The storm water management and erosion and sediment pollution controls will be in accordance with the Erosion and Sediment Pollution Control Plan that will be prepared during the RD and submitted to the Montgomery County Conservation District as a permit equivalency (see Section 3.3 above).
- Sequencing The RD will address the overall construction sequence and the sequencing of daily excavation, loadout for off-Site transportation and disposal, and final grading.

5.3 WETLAND AREA RESTORATION AND MONITORING

The remedial design will address the following aspects of the RA wetland area restoration and monitoring.

- Permit Equivalency and Wetland Area Restoration Plan The RD will
 provide a wetland area restoration plan, including specific
 requirements for areas inside the excavation areas and for areas
 outside the excavation areas. The wetland area restoration plan will
 include the technical approach to the Standard Joint Permit
 Application and will be submitted to the PADEP as a permit
 equivalency (see Section 3.3 above).
- Monitoring The RD, including the Operation and Maintenance Plan, will address the wetland area monitoring requirements.

5.4 SURFACE SOILS EXCAVATION AND OFF-SITE DISPOSAL

As discussed in Section 2, the selected remedy requires the excavation of four surface soil areas. The remedial design will address the following aspects of the RA surface soils excavation and off-Site disposal at a permitted landfill.

- Excavation The RD will address the associated temporary support features, excavation limits, excavation methods, and water management.
- Excavated material handling and off-Site disposal The RD will address
 the waste characterization for disposal facility acceptance and the
 excavated material handling.
- Storm water management and erosion and sediment pollution controls The RD will address the construction-phase and post-construction storm water management and erosion and sediment pollution controls. The storm water management and erosion and sediment pollution controls will be in accordance with the Erosion and Sediment Pollution Control Plan that will be prepared during the RD and submitted to the Montgomery County Conservation District as a permit equivalency (see Section 3.3 above).
- Sequencing The RD will address the overall construction sequence and the sequencing of daily excavation, loadout for off-Site transportation and disposal, and backfilling.

5.5 SURFACE SOILS AREA BACKFILL, RESTORATION, AND MONITORING

The remedial design will address the following aspects of the RA wetland area restoration and monitoring.

- Backfill The RD will address the backfill requirements, including the earthwork and fill requirements.
- Restoration The RD will address the restoration (i.e., seeding) requirements. The restoration will be in accordance with the Erosion and Sediment Pollution Control Plan that will be prepared during the RD and submitted to the Montgomery County Conservation District as a permit equivalency (see Section 3.3 above)
- *Monitoring* The RD, including the Operation and Maintenance Plan, will address the surface soil area monitoring requirements.

5.6 INSTITUTIONAL CONTROLS

The remedial design will address the development and implementation of institutional controls to protect the integrity of the remedy, prevent exposure to contaminated groundwater and soils, and restrict future land and groundwater use. The annual monitoring associated with the

institutional controls will be addressed in the RD and will be included in the Operation and Maintenance Plan.

5.7 DEVELOPMENT OF RA IMPLEMENTATION PLANS

This section describes the RA implementation plans that will be developed during the remedial design.

5.7.1 Construction Quality Assurance Plan

The Construction Quality Assurance Plan (CQAP) will define the scope of quality assurance to be implemented during the RA in order to verify that the construction is performed in accordance with design criteria, plans, and specifications that will be provided in the RD. The CQAP will describe the responsibilities and authority for all parties involved in the RA and the minimum qualifications of the quality assurance personnel and organizations. The CQAP will also include information on the meetings, control phases, testing and inspections, documentation, and surveying associated with the quality assurance program.

5.7.2 Remedial Action Sampling and Analysis Plan

The Remedial Action Sampling and Analysis Plan (SAP) will be developed consistent with the CQAP to measure progress toward meeting the performance standards. The SAP will include requirements for the various types of sampling and analysis to be used during the RA. The SAP will specify the equipment, methods, analytical protocols, and frequency/schedule to be followed.

5.7.3 Operation and Maintenance Plan

The Operation and Maintenance Plan will address the proposed operation, maintenance, and monitoring of the groundwater recovery system, the proposed monitoring of the wetland and surface soils areas remediated during the RA, and the proposed monitoring associated with the institutional controls. The Operation and Maintenance Plan will be updated, as necessary, following the Remedial Action construction to address any conditions resulting from modifications or as-built conditions that may occur during construction.

5.7.4 Remedial Action Health and Safety Plan

The Site-specific RD / Draft RA HASP is provided in Appendix A. The final RA HASP will present the health and safety procedures and requirements, as

well as emergency response procedures, to be implemented during the RA. The final RA HASP will be considered a "living document" that is updated through Job Hazard Analyses (JHAs). JHAs will be prepared for each task to evaluate and review with personnel the task-specific hazards prior to performing the task.

5.7.5 Remedial Action Decontamination Plan

The Remedial Action Decontamination Plan will address the RA equipment decontamination requirements to minimize the potential for transporting contamination out of active work areas or off-Site. This plan will provide the basis and minimum requirement for the RA Contractor's decontamination procedures.

5.7.6 Remedial Action Waste Management Plan

The Remedial Action Waste Management Plan will describe the types of wastes anticipated to be generated during the RA and the respective dispositions for the waste. In addition, this plan will address inventory, tracking, staging, and transportation and disposal requirements, and will address the inspections, prevention and response measures associated with spills. This plan will provide the basis and minimum requirements for the RA Contractor's waste management procedures.

5.7.7 Remedial Action Site Management Plan and Remedial Action Contingency Plan

The Remedial Action Site Management Plan (SMP) will address the following on-Site items: health and safety, communications, access and security, support facilities, and waste management. The SMP will also contain the Remedial Action Contingency Plan, which will address major or critical remedy elements that may require modification as the RA progress, and will identify potential impacts to the RA from the modifications and the plans for mitigating the potential impacts. The RA Contingency Plan will also address preparedness, communications, and response procedures that may be required during the implementation of the RA and associated field activities.

5.7.8 Institutional Control Assurance Plan

As discussed in Section 5.6 above, institutional controls will be a necessary component of the remedy. The Institutional Control Assurance Plan will address the institutional controls that will be implemented during the RA. The proposed monitoring associated with the institutional controls will be included in the Operation and Maintenance Plan.

5.8 REMEDIAL ACTION SCHEDULE

The RD will include a schedule for RA construction activities. This schedule will represent the anticipated contractor procurement schedule, sequence and duration of all major construction activities, and other RA-related activities. This schedule will form the basis for the final construction schedule to be developed and followed by the RA Contractor.

Section 6

This RD Contingency Plan identifies the major design elements that may require modification as the RD progresses. This RD Contingency Plan identifies potential impacts to the RD and the plans for mitigating the potential impacts. The major design elements that may require modification are discussed below.

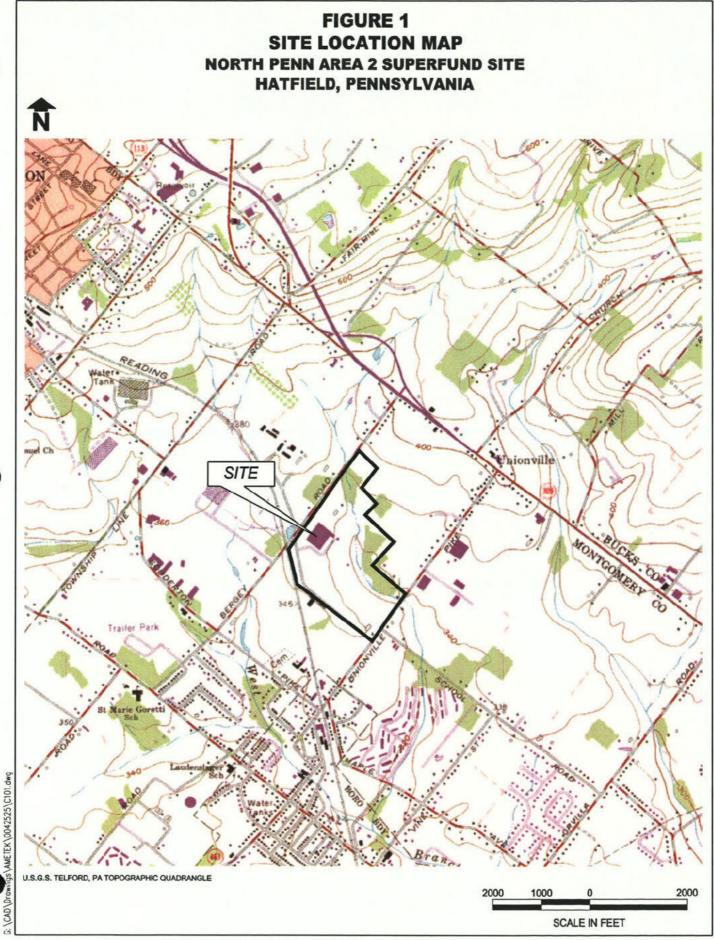
A groundwater capture zone analysis will be performed for the groundwater recovery portion of the RD. If the capture zone analysis indicates the groundwater capture is insufficient, the RD would need to be modified. For instance, the modification would be to design for a higher flow rate from the PW-3 recovery well or to add an additional groundwater capture point(s) in order to attain sufficient capture. The capture zone analysis tools would be utilized to determine the appropriate modification. If the capture zone analysis identifies a location where capture is uncertain, additional investigations or data collection will be proposed for EPA concurrence. These contingencies can be accommodated within the planned RD work and schedule.

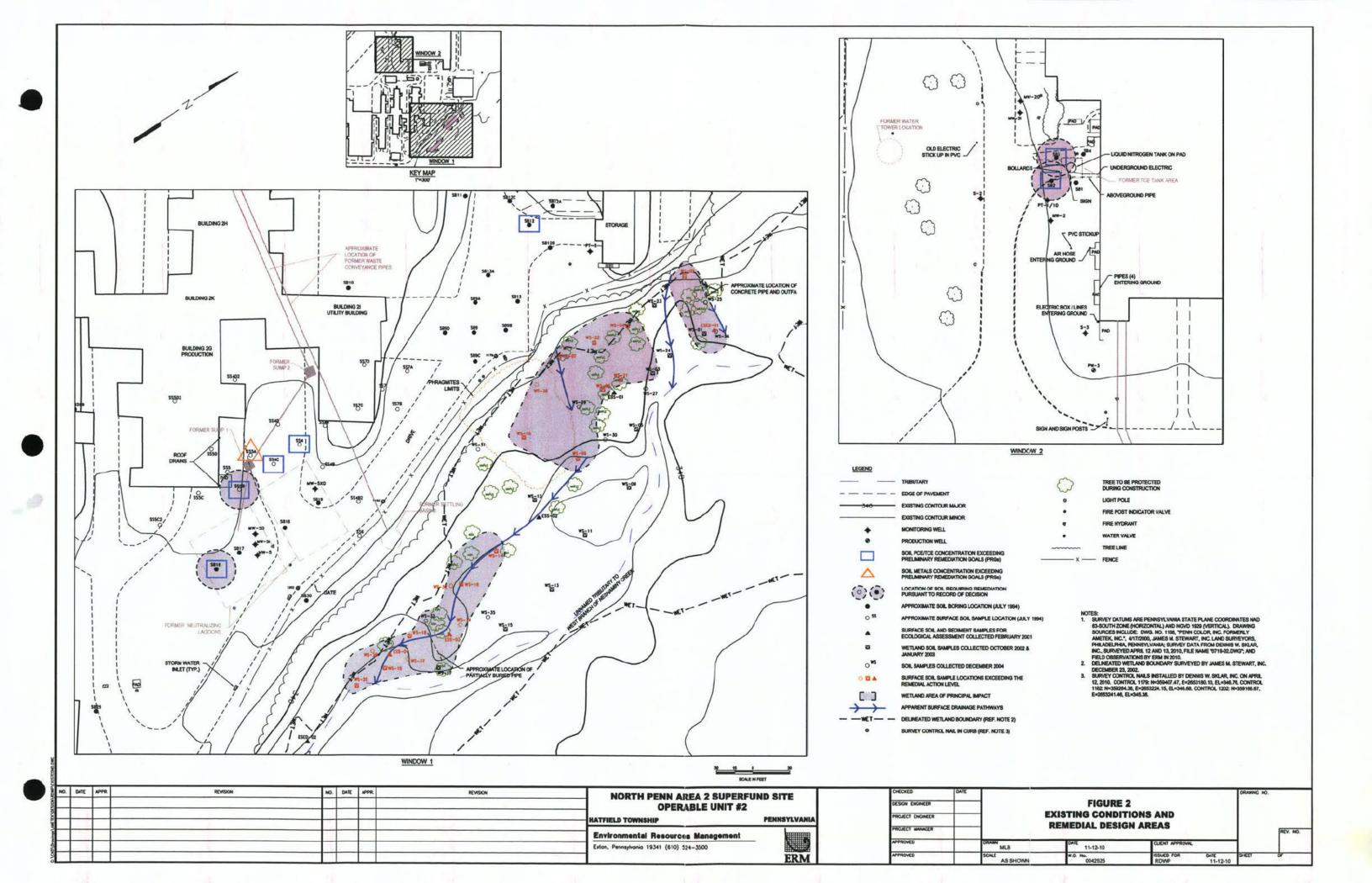
The ability of the POTW to handle the recovered groundwater will be confirmed during the RD. If the POTW is unable to handle the recovered groundwater, significant additional design work including treatability studies and permitting studies may be required to evaluate treatment and discharge options. This contingency may trigger a request to EPA for revision to the RD scope and schedule.

EPA has requested that the Threatened and Endangered Species information be updated. This would pertain mostly to the wetland work. If this information indicates a change from previous information, the wetland work may need to be redesigned to accommodate species present at the Site by adjusting the planned remedial area or methods to avoid impacts. This contingency can be accommodated within the planned RD work and schedule.

Figures

Figures





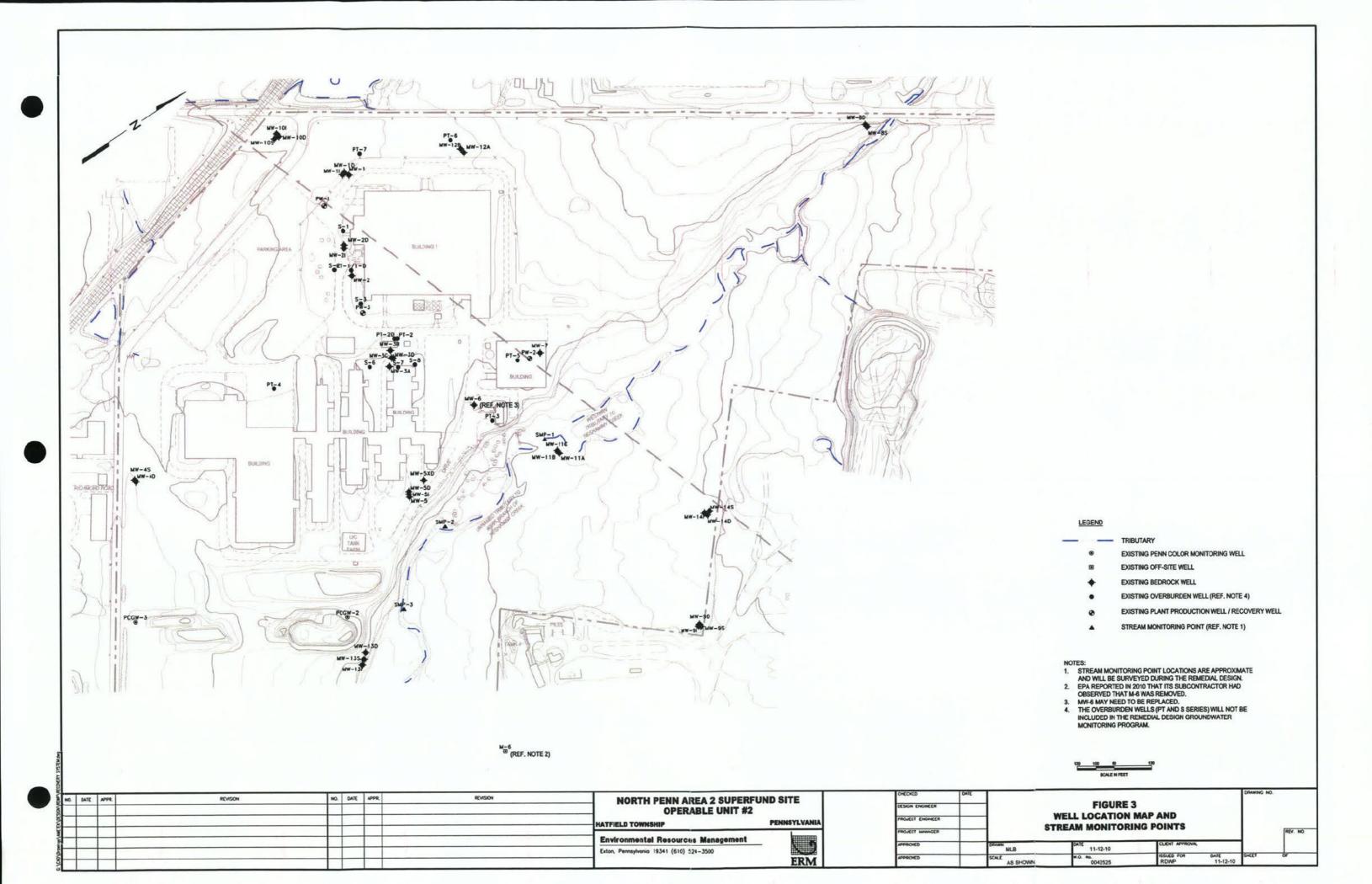
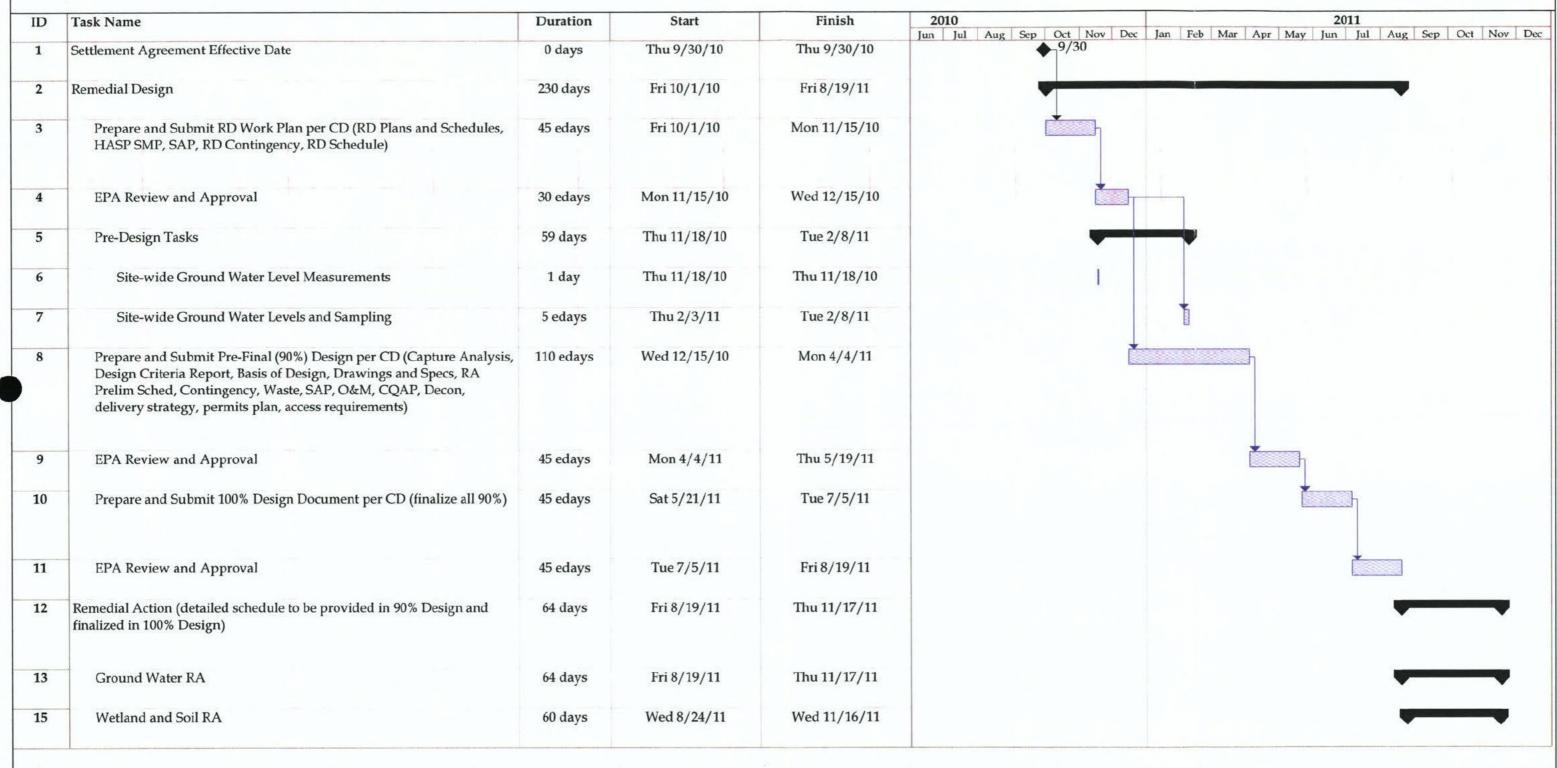


Figure 4
Remedial Design/Draft Remedial Action Schedule
North Penn Area 2 Superfund Site
Hatfield Township, Pennsylvania





Table

Tables

Table 1 Cleanup Levels for Groundwater

Contaminant of Concern	Cleanup Level (µg/L)	Basis for Cleanup Level (µg/L)
Carbon Tetrachloride	5	MCL
1,2-Dichloroethane	5	MCL
Cis-1,2-Dichloroethene	70	MCl
1,1-Dichloroethene	7 .	MCL
Tetrachloroethene (PCE)	5	MCL
Trichloroethene (TCE)	5	MCL
Vinyl Chloride	2	MCL
Antimony	6	MCL
Arsenic	10	MCL
Manganese	217	RISK-BASED
Thallium	0.5	NON-ZERO MCLG
1,4-Dioxane	6.1	RISK-BASED
	AND	

Cumulative excess cancer risk associated with potential residential use of the groundwater at 1.0×10^4 or less and the HI at 1.0 or less (target-organ specific)

Table 2 Cleanup Levels for Wetland Soil

Contaminant of Concern	Cleanup Level ¹ (mg/Kg)	Average Residual ² (mg/Kg)	Maximum Residual ³ (mg/Kg)
Arsenic	9.5	8.7	25.8
Cadmium	55	38.9	95.9
Chromium	43	39.4	91.6
Lead	143	35.3	79.5
Zinc	1662	78.2	211

¹ Represents the residual average cleanup goal (95% Upper Confidence Limit or UCL), which is the Wetland Soil Cleanup Level

² Represents the residual concentrations (95% UCL) left after remediation to the cleanup level

³ Represents the maximum concentrations left after remediation to the cleanup level

Table 3
Cleanup Levels for Surface Soil

Contaminant of Concern	Cleanup Level (mg/Kg)	Basis for Cleanup Level (µg/L)	Risk at Cleanup Level
Tetrachloroethene (PCE)	0.0047	RBC, migration to groundwater	
Trichloroethene (TCE)	0.00026	RBC, migration to groundwater	Cumulative risk < 1E-04 or Hazard Index (HI) <1
Antimony	13	Risk Assessment	
Arsenic	9.5	Risk Assessment	· ·
Thallium	3.6	Risk Assessment	

Appendices

Appendices

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Appendix A

Remedial Design/Draft Remedial Action Health and Safety Plan AMETEK, Inc. and Penn Color, Inc.

Remedial Design / Draft Remedial Action Health and Safety Plan North Penn Area 2 Superfund Site

November 12, 2010

Project No. 0042525 Intersection of Bergey Road and Richmond Road Hatfield Township, PA 19440

(b) (4) , P.E.

Partner-in-Charge

b) (4) , E.J.T

Project Manager

(b) (4) , ASP

Project H&S Director

ERM

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SITE-SPECIFIC REMEDIAL ACTION HEALTH AND SAFETY PLAN

ERM developed the following Site-specific Remedial Action Health and Safety Plan (HASP) for use by ERM personnel and by ERM contractors (individually, an "ERM Contractor" and collectively, "ERM Contractors"). ERM personnel must adhere to the practices and procedures specified in the HASP. Each ERM Contractor must review the HASP and agree to accept and abide by the HASP, subject to any modifications to the HASP (to address the ERM Contractor's more stringent practices and procedures) agreed upon in writing by ERM and the ERM Contractor. The ERM Contractor shall indicate such acceptance by signing this document prior to commencing work at the Site. However, if any ERM Contractor commences work at the Site, the ERM Contractor shall be deemed to have accepted the HASP and the terms hereof and the failure to execute and return to ERM a copy of this notice shall not be relevant to such interpretation.

If a contractor or a person other than the Client, ERM employees and ERM Contractors (individually, a "Third Party" and collectively, "Third Parties")

_receives a copy of the HASP, such Third Party should not assume that the HASP is appropriate for the activities being conducted by the Third Party.

NO THIRD PARTY HAS THE RIGHT TO RELY ON THE HASP. EACH THIRD PARTY SHOULD ABIDE BY ITS OWN SITE-SPECIFIC HEALTH AND SAFETY PLAN IN ACCORDANCE WITH ITS OWN PROFESSIONAL JUDGMENT AND ESTABLISHED PRACTICES.

ERM shall not be responsible for the implementation of any Third Party safety program(s), except to the extent otherwise expressly agreed upon by ERM and a Third Party in writing. The services performed by ERM for the Client and any right of the client and/or an ERM Contractor to rely on the HASP shall in no way inure to the benefit of any Third Party, including, but not limited to, employees, agents, or consultants and subcontractors of ERM Contractors, so as to give rise to any cause of action by such Third Party against ERM.

The HASP generated by ERM in connection with the Project is for use on a specific site and in connection with a specific project. ERM makes no representation or warranty as to the suitability of the HASP for reuse on another site or as to the suitability of the HASP for reuse on another project or for modifications made by the Client or a Third Party to the HASP.

All entrants to portions of the jobsite controlled by ERM must sign the HASP. Signing below certifies understanding and willingness to comply with the contents of this HASP. ERM has prepared this plan solely for the purpose of protecting the health and safety of ERM employees. Subcontractors, visitors, and others at the site are required to follow provisions in this document at a minimum, but must refer to their organization's health and safety program for their protection.

Printed Name	Signature	Company	Date
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1.0 PROJECT AND SITE INFORMATION

1.1 GENERAL PROJECT INFORMATION

ERM developed this Remedial Design/Draft Remedial Action Health and Safety Plan (HASP) on behalf of AMETEK, Inc. (AMETEK) and Penn Color, Inc. (Penn Color) for use during the Remedial Design (RD) and Remedial Action (RA) at the North Penn Area 2 Superfund Site.

The major anticipated on-Site activities during the RD and construction phase RA work are listed in Section 4.0 of this document.

The Site Location Map and Map to Hospital is provided in Appendix A.

1.2 SITE NAME AND ADDRESS

Penn Color, Inc. Intersection of Bergey Road and Richmond Road Hatfield Township, Pennsylvania 19440

1.3 SITE DESCRIPTION

As originally listed, the North Penn Area 2 Superfund Site was comprised of eight properties totaling approximately 330 acres. The Remedial Investigation (RI) indicated that the 87-acre Penn Color (former AMETEK) facility had contamination that affected groundwater. The RD and RA address the contamination at the former AMETEK facility.

The Site is an area of approximately 87 acres located at the intersection of Bergey Road and Richmond Road in Hatfield Township, Montgomery County, Pennsylvania. A Site Location Map is presented in the Remedial Design Work Plan (RDWP) and on the cover sheet of the RD Drawings. A summary of the Site history and enforcement activities is provided in Section 2.0 of the Record of Decision (ROD) issued by the United States Environmental Protection Agency (EPA) in April 2009. Groundwater is contaminated with volatile organic compounds (VOCs), one semi-volatile organic compound (SVOC), and metals. Wetland soils at the Site are contaminated with metals, including arsenic, cadmium, chromium, lead, and zinc. Surface soils are contaminated with VOCs and metals. The Site was listed on the National Priorities List (NPL), on October 4, 1989, in part because of the discovery in 1986 of VOCs in drinking water supply wells operated in the area by the North Penn Water Authority (NPWA). The Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) identification number for this Site is PAD002342475.

The EPA is the lead agency for Site activities and the Pennsylvania Department of Environmental Protection (PADEP) is the support agency. EPA has reached prior settlements with potentially responsible parties (PRPs) under which some

of the PRPs performed the Remedial Investigations and EPA investigated the other properties. The PRPs performed the Remedial Investigation (RI, ERM 2005) and Feasibility Study (FS, ERM 2006) at the Site pursuant to an administrative order on consent with EPA. The RD and RA will address contamination in the groundwater, wetland soils, and surface soils at the Site in the areas designated on Figure 2 of the RDWP and on the RD Drawings. The proposed remedy comprises a comprehensive remedy for the Site and no further actions are anticipated after RA implementation.

CLIENT HEALTH & SAFETY REQUIREMENTS

1.4

The client does not have any special requirements for the work governed by this HASP, other than those described in subsequent sections below.

2.0 KEY PROJECT PERSONNEL AND RESPONSIBILITIES

Table 2-1 includes the roles, names, contact information, and responsibilities of ERM personnel, ERM Contractors, and other individuals associated with the health and safety leadership of this project. This page must be posted on-Site.

TABLE 2-1: Key Project Health & Safety Personnel

Role	Person	Contact Information	Responsibilities
Partner-In-Charge	(b) (4)	Office: (b) (4)	Final authority in approving
(PIC)		(b) (4)	the HASP and ensuring that
		E-mail:	the project team is supplied
		(b) (4)	with the training, equipment
			and materials necessary for
		•	a safe work environment.
Project Manager	(b) (4)	Office: (b) (4)	Implementing the
(PM)	,	(b) (4)	requirements of the ERM
()			Health & Safety Program on
,			this project and maintaining
			management awareness of
			the project's health and
			safety status. Provide H&S
			leadership during project
On Site Comptantion	(1-) (4)	(h) (4)	performance.
On-Site Construction	(b) (4)	Office: (b) (4)	Assist the PM by
Manager (On-Site CM) /		(b) (4)	implementing HASP on a
Site Safety Officer			day-to-day basis. Recognize
(SSO)			significant H&S hazards and
		·	utilize STOP WORK
		(b) (1)	authority when appropriate.
Subject Matter Expert	(b) (4)	Office: (D) (4)	Assist in the recognition,
		(b) (4)	evaluation, and control of
•			hazards associated with the
			site.
ERM Employees	Listed on Signature	N/A	ERM employees will fully
-	Page		participate in the
		· ·	implementation of the HASP
			by obtaining necessary
·	'		training, attending site
			safety meetings, wearing
	ĺ.		designated PPE, complying
			with site H&S rules, and
			advising the SSO of H&S
			concerns at the site.
Client Contact	Tom Deeney	Office: (b) (4)	
	(AMETEK)	(b) (4)	
	. '	E-mail:	
		tom.deeney@ametek.com	* •
Subcontractor Safety	To Be Determined	Office:	
Contact	. J be betermined	Mobile:	
		E-mail:	
Local First Responders	Police, Fire	911	
Detail 1 15t heaponders	Department and		
	Ambulance		1
Local Hospital (attach	Grand View	Emergency: 215-453-4674	
map)	Hospital	General: 215-453-4000	
······································	1103bim)	General, 213-433-4000	

All ERM and ERM Contractor personnel working on-site (including their on-site supervisors) who may be exposed to hazardous substances, health hazards, or safety hazards will not be permitted to participate in or supervise field activities until they have been trained to a level required by their job function and responsibility, and medically qualified to perform the work. Prior to mobilization, all site workers are required to have the following training and medical surveillance:

- Training meeting the requirements of 29 CFR 1910.120 or 29 CFR 1926.65 (as applicable), Hazardous Waste Operations and Emergency Response (HAZWOPER).
- For RD and RA activities on-Site, ERM will identify and provide a On-Site Construction Manager (On-Site CM) who will serve as Site Safety Officer (SSO) and Emergency Coordinator. In addition to HAZWOPER training, the SSO-should have 8-hour-Supervisory, Fire Extinguisher, and First Aid/CPR training, unless specifically waived by the PM in consideration of the scope and duration of the task (waiver to be documented in the job hazard analysis [JHA]).

The On-Site CM / SSO must possess additional training, as described below:

- HAZWOPER Supervisor training
- 10-hour OSHA Construction training
- Fire Extinguisher training
- First Aid/CPR training

The SSO will verify that Site personnel have received all appropriate training as required by this HASP prior to their arriving on-Site by reviewing written training documentation. Copies of the written training documentation will be retained in the project file. ERM Contractor personnel will not be allowed to work at the Site unless said training documentation is available.

FIELD ACTIVITIES 4.0

MAJOR PROJECT TASKS 4.1

Major tasks (and the components of the tasks) to be performed by ERM personnel and/or ERM subcontractors include the following.

Remedial Design

- The installation and surveying of three stream level monitoring points in the intermittent stream in November 2010.
- A round of water level measurements in all Site wells and the intermittent stream in November 2010.
- A round of groundwater sampling from all Site wells and water level measurements in all Site wells and the intermittent stream in spring of 2011.
- General site visits to evaluate work elements as required by the design.
- Any additional site investigations identified during the course of the Remedial Design process necessary for its completion.

Remedial Action

- Installing and maintaining temporary Site facilities including construction trailer, construction entrance, decontamination pad, staging areas, and removing them at the completion of construction-phase remedial activities.
- If necessary, connecting and maintaining temporary Site utilities including telephone, electricity, and internet.
- Installing and maintaining soil erosion and sediment control measures, such as rock construction entrance and perimeter sediment controls (e.g., straw bale barrier, coir logs, or filter socks).
- Installing root zone protection boundary for trees identified for protection, installing protection fencing for existing features such as wells, and removing existing chain link fence as necessary for access to the wetland area.
- Clearing and chipping vegetation as needed for project execution. Stumps will be grubbed as part of wetland excavation.
- Excavating soil/sediment and grubbing stumps. Excavation methods include the use of vacuum truck as well as standard excavation equipment. Managing grubbed stumps.
- Excavating surface soil, subject to post-excavation sampling and excavation stability requirements.
- Managing and addressing excess moisture in excavated material if necessary. Loading excavated material for off-Site transportation and disposal.
- Managing construction-phase water from excavation areas, sediment staging pad, and decontamination pad.

- Placing soil backfill and constructing final grades.
- Implementing the Wetland Area Restoration Plan, including grading wetland excavation area side walls, seeding, and planting. Seeding the backfilled surface soil excavation areas and other disturbed areas.
- Other tasks as identified or provided by subcontractors.

Implementation of the RA will also include long-term operation and monitoring of the groundwater extraction system to maintain capture of affected groundwater and to achieve cleanup within the expected timeframe.

The scope of these activities is described in the RDWP and the Remedial Design. This HASP is an Appendix to the RDWP and the Remedial Design. Each of the major tasks above will have a Safe Work Practice (SWP) associated with it, or Job Hazard Analysis (JHA) prepared for it, prior to the work being performed. SWPs and JHAs are further described below.

4.2 SITE PERSONNEL JOB TASKS & CERTIFICATION REQUIREMENTS

Workers with the following job descriptions will be engaged in activities conducted in at the site.

Technical Personnel - This group includes the ERM and ERM subcontractor personnel, as well as representatives from AMETEK, Penn Color, EPA, United States Army Corps of Engineers (USACE), and/or Pennsylvania Department of Environmental Protection (PADEP) serving in various technical, supervisory, and data collection functions, including management, inspection, and sample collection.

Heavy Equipment Operator - The heavy equipment (e.g., trackhoe, loader) operator operates the equipment from inside environmentally controlled cab within the boundaries of the identified work zone.

Truck Driver - The truck driver operates the vehicle from the cab. Trucks will be used for hauling excavated materials to the staging area, transporting off-Site for disposal, and hauling clean fill to the Site and to excavation areas.

Laborers – Field laborers will be used during completion of all work activities. In addition to providing assistance where needed for those activities listed in Section 4.1, other work duties will include, but are not limited to, construction of site structures (decontamination pad, trailer setup/renovation), vacuum truck operation, operation of storm water pumps, maintenance of erosion and sediment pollution controls, equipment decontamination, and general Site and equipment upkeep and maintenance.

Surveyors - This group includes contracted personnel engaged in topographical surveys and delineation of the project Site.

Other visitors to the site not directly involved in proposed work activities (i.e., various terminal employees and contractors) will be considered in the HASP as technical personnel listed above.

5.0 HAZARD IDENTIFICATION AND CONTROL

5.1 JOB HAZARD ANALYSES

Prior to initiating any new project activity not covered by a Safe Work Practice, or when there is a change in site conditions, the SSO will assist project team members in completing a Job Hazard Analysis (JHA). The JHA will list the hazards associated with the project activity as well as associated control strategies. JHAs for some of the tasks listed in Section 4.1, as well as a blank copy of the JHA form, are located in Appendix B.

5.2 SAFE WORK PRACTICES

ERM has Safe Work Practices (SWP) that define minimum requirements for controlling hazards related to the work and surroundings. These have been completed for tasks performed commonly by ERM employees. As such, jobsite tasks whose hazards are identified and controlled by use of a SWP do not require JHAs to be developed for them. Copies of the SWPs that have been identified as pertinent to the hazards inherent in the work for this project are identified in the table of contents and have been included in Appendix C.

5.3 SITE INSPECTIONS

The SSO or designee will inspect the jobsite at least once per day using the Site Inspection Checklist in Appendix E as a guide. Completed checklists will be retained in the site safety file.

5.4 BEHAVIOR-BASED SAFETY

As part of this project, everyone on-Site will make a commitment to work safely and to look out for others on the jobsite. The daily safety meetings and Daily Safety Meeting Documentation Forms will be used to help ERM personnel and ERM Contractors to think about the safety related aspects of the work at hand, as described in applicable JHAs.

5.5 STOP WORK AUTHORITY

It is ERM policy that all Site personnel have the authority, without fear of reprimand or retaliation, to:

- Immediately stop any work activity that presents a danger to the Site team or the public; and
- Get involved, question, and rectify any situation or work activity that is identified as not being in compliance with the HASP or with broader ERM health & safety policies.

All Site personnel are empowered to identify and correct Unsafe Acts, Unsafe Conditions, and Near Misses before they could cause an Incident (see Section 13). A common phrase used in this health and safety program is:

You see it, you own it!

If someone utilizes their Stop Work Authority, then work can only be restarted by the SSO, in concert with the PM and PIC.

5.6 CHEMICAL HAZARDS

Chemicals may be introduced into the body by ingestion, inhalation, or absorption through the skin. Since not all chemicals have the same level of toxicity, the length of time for the exposure and the concentration of the chemical are important in determining the risk. Inhalation and skin contact are the most common routes of entry. Chemicals can be introduced into the body by ingestion when chemicals present on the hands are transferred to food or cigarettes.

Based on historical soil and ground water sampling, the following constituents of concern listed in Table 5-1 may be encountered at the Site. Universal Chemical Safety Data Cards for the constituents of concern are located in Appendix H.

TABLE 5-1: Constituents of Concern

Carbon Tetrachloride	Arsenic
1,2-Dichloroethane	Manganese
Cis-1,2-Dichloroethene	Thallium
1,1-Dichloroethene	1,4-Dioxane
Tetrachloroethene (PCE)	Cadmium
Trichloroethene (TCE)	Chromium
Vinyl Chloride	Lead
Antimony	Zinc

Table 5-2 shows chemicals that are routinely used by ERM at the Site as part of the project. The Material Safety Data Sheets (MSDSs) for these chemicals are located in Appendix 1.

TABLE 5-2: Chemicals Used for Project Execution

Isobutylene Balance Air (calibration gas)	Gasoline (RA only)
Alconox	Diesel (RA only)

5.7 AMBIENT AIR MONITORING

Ambient air monitoring should be conducted by the SSO when there is a question of employee exposure to hazardous concentrations of substances to assure the proper selection of engineering controls, work practices, and PPE.

Additional monitoring should be conducted under any of the following circumstances.

- · Work begins on a different portion of the Site;
- Change in job tasks;
- Change in weather;
- Change in ambient levels of hazardous constituents as indicated by the sense of smell or changes in the physical appearance of the soil or ground water;
- When new hazardous substances are encountered; and
- During high-risk operations (e.g. drum opening, or handling of leaking drums, or when working in areas with obvious liquid contamination).

Ambient air monitoring will be conducted using direct-reading real-time instruments as indicated in Table 5-3. If more then one instrument is listed, either instrument may be chosen. Not all work at the Site will require ambient air monitoring for all-contaminants. During the RD, a Photo-Ionization Detector (PID) will be used to monitor the breathing zone only, whereas during the RA, additional areas and contaminants will be monitored. During the mobilization phase of a particular project task or activity, either the PM or the SSO will determine what contaminants may be encountered in order to have the appropriate instrumentation on-Site. The Project Health and Safety Consultant is available to assist the PM or the SSO in determining the appropriate instrumentation.

TABLE 5-3: Ambient Air Monitoring Instruments

Constituent	Instrument
Organics (RD and	OVM Model 580B with 10.6 eV lamp or
RA)	MiniRae 2000 with 10.6 eV lamp or equivalent - if you are unsure
	what kind of organic vapor monitor to use based on the
	contaminants of concern, contact your OpCo H&S representative.
	Remember, straight chain hydrocarbons do not register well on
	PID units and a FID may be required.
Dust (RA)	MIE PDR 1000 Personal DataRAM Aerosol Monitor

Direct reading instrumentation will be calibrated daily per manufacturer's instructions. Cylinders of the appropriate calibration gas will be required for fieldwork lasting longer than one day.

Under stable Site conditions and based on the professional judgment of the SSO or the Subject Matter Expert, ambient air monitoring will be conducted at least once every two hours in the workers' breathing zone and at other locations. Ambient air monitoring results will be recorded on the Ambient Air Monitoring Form found in Appendix J. If Site conditions become unstable or change dramatically, ambient air monitoring will be conducted more frequently based on the professional judgment of the SSO or the Subject Matter Expert.

Table 5-4 outlines the steps to be taken by the SSO during the RD and RA when the action levels of the various contaminants are exceeded. Respiratory protection is selected based on occupational exposure limits of the constituents at the Site and the potential for exposure to vapors and dust from Site activities.

5.8 SAFE WORK PERMIT FORM

Although not anticipated to be necessary for work performed during the RD or RA, a draft Safe Work Permit form is provided in Appendix G. This form should be used when performing hot work (e.g., welding), confined space entry, or line breaking.

TABLE 5-4: Action Levels and Response Actions Requirements

Chemical	Action Level	Response Actions
Organics	PID reads between 1 ppm and 5 ppm sustained in the breathing zone for 1 minute	 Stop work, and have workers leave immediate area SSO evaluates need for Tyvek coveralls, dons half-face respirator with organic vapor cartridges, and monitors again after allowing vapors to dissipate. If readings are less than 1 ppm, resume work. If readings are 5 ppm or greater, resume work wearing half-face respirators with organic vapor cartridges and Tyvek coveralls if required
	PID reads 5 ppm or greater sustained in the breathing zone for 1 minute	 Stop work, and have workers leave immediate area. Contact On-Site CM / SSO. Evaluation work practices and assess engineering controls to reduce airborne concentrations. SSO waits 15 minutes, evaluates need for Tyvek covers, dons half-face respirator with organic vapor cartridges, approaches work area slowly, if PID reaches 5 ppm, back out and wait an additional 15 minutes before repeating monitoring.
Dust (RA	Visible dust or greater	Stop work and have workers leave the immediate
only)	than 2.5 mg/m ³ sustained in the breathing zone for 1 minute	 SSO evaluates need for Tyvek coveralls, dons half-face respirator with high-efficiency particulate air (HEPA) cartridges and monitors again after allowing dust to dissipate.
		 If readings are less than 1 mg/m³, resume work. If readings are 5 mg/m³ or greater, resume work wearing half-face respirators with HEPA cartridge and Tyvek coveralls if required.
	Greater than 5 mg/m ³ sustained in the breathing zone for 1	Stop work, and have workers leave the immediate area.
	minute.	 Contact On-Site CM / SSO. Evaluate work practices and assess engineering controls to reduce airborne concentrations. Implement dust suppression. SSO waits 15 minutes, evaluates need for Tyvek
		coveralls, dons half-face respirator with HEPA cartridges, approaches work area slowly; if readings reach 2.5 mg/m³, back out and wait an additional 15 minutes before repeating monitoring.

6.0 PERSONAL PROTECTIVE EQUIPMENT

The level of PPE selected for a task is based on the following:

- Type and measured concentration of the chemical substance in the ambient atmosphere and its toxicity;
- Potential for exposure to substances in air, splashes of liquids, or other direct contact with material due to work being done; and
- Knowledge of chemicals on-Site along with properties such as toxicity, route of exposure, and contaminant matrix.

In situations where the type of chemical, concentration, and possibilities of contact are not known, the appropriate level of protection must be selected based on professional experience and judgment until the hazards can be better identified.

In addition to summarizing the general PPE requirements for-tasks performed at the Site, Table 6-1 also serves as the written certification that the PPE Hazard Assessment has been conducted. The signature page containing the client's name, project name and number, date and signatures of the parties responsible for the development of the HASP also serve as part of the written certification.

6.1 RESPIRATORY PROTECTION

The type of respiratory protection required will be based on the results of ambient air monitoring, the results of any models used to predict ambient air concentrations, and the professional judgment of either the SSO or the Project Health and Safety Consultant. Respiratory protection requirements are outlined on Table 5-4, above.

TABLE 6-1: Personal Protection Equipment Requirements

PPE Level	Ensemble Components	Tasks Requiring Use
Level D	Long pants and shirt with sleeves.	All project activities
Should be worn only as a work uniform and not in any area with respiratory or skin hazards. It provides minimal protection against chemical hazards.	 Safety-toed footwear. Safety glasses with molded side shields. Hard hat. General purpose work gloves if task does not involve water or wet materials. Hearing protection (where appropriate) High visibility traffic vest (where appropriate) 	
Modified Level D	 Level D and the following: Disposable Tyvek coveralls Safety-toed rubber boots or disposable boot covers over shoes Thin nitrile gloves Green nitrile gloves over thin nitrile gloves, when primary gloves may tear or puncture. 	A task having direct contact with COCs-is not-expected to be common on this project. Subsurface sampling or probing of the wetlands may merit this protection level. The SSO and On-Site CM will review daily tasks and assess the need for this level of protection.
Level C Should be worn when the criteria for using airpurifying respirators are met, and a lesser level of skin protlection is needed.	Level D or Modified Level D and the following: • Half- or full-face air purifying respirator with combination organic vapor/HEPA cartridges. However, not anticipated to be required.	Tasks requiring Level C PPE are not anticipated during this project. If Level C PPE is needed, as determined by the SSO and On-Site CM, work will be temporarily stopped until the situation is reassessed and the HASP will be revised as necessary.
Level B Should be worn when the highest level of respiratory protection is needed, but a lesser level of skin protection is needed.	Not anticipated to be required	Tasks requiring Level B PPE are not anticipated during this project. If Level B PPE is needed, as determined by the SSO and/or the Project Health and Safety Consultant, the HASP will be revised.
Level A Should be worn when the highest level of respiratory, skin, and eye protection is needed.	Not authorized for this project	Tasks requiring Level A PPE are not authorized during this project. If Level A PPE is needed, as determined by the SSO and/or the Project Health and Safety Consultant, contact the North America H&S Leader for assistance.

MEDICAL SUPPORT REQUIREMENTS

7.0

First aid supplies will be made available to all personnel on-Site. Field staff personnel are provided with a general first aid kit suitable to treat minor lacerations and must be kept at the project Site during all field activities.

For the duration of the project, at least one individual currently certified to render emergency first aid and/or CPR will be present during all work activities. Additional medical surveillance will be provided for employees who are injured, become ill or develop signs or symptoms due to possible exposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.

SITE INFRASTRUCTURE, CONTROL, AND GENERAL RULES

8.1 INFRASTRUCTURE

8.0

8.1.1 Smoking and Eating Areas

Smoking will only be allowed in designated areas. Upon mobilization at the Site, the SSO will establish smoking areas per Site-specific or client-specific requirements. Individuals caught smoking outside the designated smoking areas will be subject to disciplinary action up to and including immediate termination from the project.

Upon mobilization at the Site, the SSO will establish eating and break areas per Site-specific or client-specific requirements. Eating will only be allowed in the designated areas and the areas will be maintained in a clean and sanitary condition. Employees will wash their hands before entering eating areas.

8.1.2 Sanitation and Potable Water

Containers used for drinking water will be equipped with a tap and capable of being tightly closed. In addition, the container will be labeled as "Drinking Water" or "Potable Water." Disposal cups will be stored in a sanitary condition and a receptacle for disposing of the cups will be near-by.

Potable and nonpotable water containers and portable toilets (if used) will comply with OSHA 29 CFR 1910.141 requirements. Hand wash and/or hand sanitizers will be provided.

8.1.3 Temporary Facilities

Trailers and other temporary structures used as field offices or for storage during the RA will be stabilized or anchored appropriately. The anchor system will be designed to withstand winds and must meet applicable state or local regulations for the anchoring of mobile trailer homes.

All temporary facilities will be maintained in a clean and sanitary condition to discourage the entrance of rodents or vermin. If rodents or vermin become an issue, the SSO or RA Contractor will be responsible for implementing an extermination program per Site-specific or client-specific guidelines.

8.1.4 Safety Equipment

A first aid kit containing first aid items for minor incidents only and a fire extinguisher is maintained in each ERM vehicle. Also, each piece of heavy equipment will have a fire extinguisher on board. In addition, a 20-pound ABC fire extinguisher will be located within 75 feet of the fueling station/diesel storage tank. The office trailer will also have at least one fire extinguisher mounted in a readily assessable location.

The SSO will be responsible for ensuring that all fire extinguishers are inspected approximately monthly as required by 29 CFR 1910.157 *Portable Fire Extinguishers*. The monthly inspections will be documented on a tag attached to each extinguisher or a master list of fire extinguishers and their location. If the duration of the project exceeds one year, the SSO will contract with an outside vendor to perform the annual maintenance on all fire extinguishers.

ERM employees are provided with portable eye wash bottles and must maintain the eye wash bottle in an accessible area during field activities. In addition, eye wash stations may be located in the Penn Color facility. The locations of eye wash bottles and stations will be reviewed during the daily health and safety meetings.

8.1.5 Communications

Cell phones will be used for communication between the project team and the client. However, cell phones cannot be used while driving any type of vehicle. Two-way radios may also be utilized for communication between project teammembers.

8.2 SITE CONTROL

ERM employs a strict "buddy system" that all workers must adhere to while on the property. At least two team members must be in sight of one another at all times while working on-Site.

Safety traffic cones and/or barricade tape will be utilized to demarcate work areas so that unauthorized personnel do not enter.

- Exclusion Zone The area immediately surrounding excavation activity shall be considered the Exclusion Zone (EZ). To the extent possible, all entry/egress from this area shall be through a single entry/exit point established in an upwind direction from the proposed activity. The EZ shall not be accessed from any other direction or location without explicit approval of the SSO, or unless an emergency situation has developed which necessitates immediate evacuation of the work area (contaminant release, fire, explosion, etc.). The proper levels of PPE shall be worn at all times, as specified by the SSO and HASP, within the EZ. Only authorized personnel are permitted in the EZ.
- Contamination Reduction Zone A primary Contaminant Reduction Zone (CRZ), designed to ensure the proper decontamination of all personnel and equipment entering and leaving the primary areas of investigation will be established. A decontamination pad will be used for heavy equipment (excavators, etc.). Sample containers and sampling equipment shall be stored within the CRZ. Additionally, the proper levels of PPE shall be worn at all times, as specified by the SSO and HASP, within the primary CRZ.

Support Zone - The Support Zone (SZ) will be established, and will
consist of support vehicles, emergency communication equipment, first
aid supplies and other equipment needed to monitor or perform site
sampling activities. This area shall remain as the "clean" area due to
strict enforcement of decontamination procedures by the SSO.

8.3 GENERAL SITE RULES

The following general rules will be adhered to at all times.

- All personnel entering the Site must check in with the SSO.
- All individuals entering the Site must demonstrate to the SSO that they
 have been adequately trained as defined in this HASP.
- All individuals must be familiar with emergency communication methods and how to summon emergency assistance.
- Use of alcoholic beverages before, during operations, or immediately
 after hours is absolutely forbidden. Alcohol can reduce the ability to
 detoxify compounds absorbed into the body as the result of minor
 exposures and may have negative effects with exposure to other
 chemicals. In addition, alcoholic beverages will dehydrate the body and
 intensify the effects of heat stress.
- Horseplay of any type is forbidden.
- All unsafe conditions will be immediately reported to the SSO, who will
 document such conditions in the field log. The SSO will be responsible
 for ensuring that the unsafe condition is correctly as quickly as possible.
- No smoking, eating, chewing gum or tobacco, taking medication, or applying cosmetics in the Contamination Reduction Zone or the Exclusion Zone.
- Smoking, matches, and lighters are only allowed in the designated smoking area.
- Avoid contact with potentially contaminated substances. Avoid, whenever possible, kneeling on the ground, or leaning or sitting on potentially contaminated trucks, equipment, or ground. Do not place equipment on potentially contaminated surfaces.
- If PPE becomes torn or saturated with contaminated material, immediately leave the Exclusion Zone, go through the decontamination steps, and replace the affected PPE. Additionally, wash any exposed skin thoroughly with soap and water.

• The SSO will be responsible for determining what Site work can be performed safely in the rain and at what point work will cease due to either quality or safety issues. In the event of thunder and/or lightning, all work will be suspended until 15 minutes have elapsed from the last clap of thunder or flash of lightning. During rain, lightning, and/or thunder events, Site workers should seek shelter in either a building or vehicle. In the event of a tornado, Site workers should seek shelter in a building, except trailers, or in a low-lying area.

9.0 DECONTAMINATION PROCEDURES

Decontamination of personnel is not expected to be necessary during RD activities. Decontamination of equipment during the RD will be in accordance with the Sampling and Analysis Plan provided in the RDWP. Personnel and equipment decontamination during the RA is discussed below.

Decontamination involves the orderly controlled removal of contaminants from both personnel and equipment. The purpose of decontamination procedures is to prevent the spreading of contaminated materials into uncontaminated areas. All Site personnel should limit contact with contaminated soil, groundwater, or equipment in order to reduce the need for extensive decontamination.

Equipment and materials used in the decontamination process may include the following:

- Hand tools for gross decontamination (scraping) of equipment;
- High pressure or hot water cleaning;
- Phosphate-free detergent;
- Five-gallon bucket;
- Potable water;
- Distilled water;
- Water;
- · Paper towels; and
- Brushes.

9.1 PERSONNEL DECONTAMINATION

The following procedures will be utilized for personnel decontamination:

- 1. Clean rubber boots with water;
- 2. Remove all PPE and dispose of the PPE in the designated locations, in accordance with the Remedial Action Waste Management Plan (an appendix to the RD); and
- 3. Wash hands and any skin that may have come in contact with affected soil or groundwater with moistened disposable towels, such as baby wipes, or soap and water.

9.2 EQUIPMENT DECONTAMINATION

Equipment decontamination requirements are provided in the Remedial Action Decontamination Plan (an appendix to the RD). The following may also be required for equipment and tool decontamination; however, the RA Decontamination Plan governs.

- Before leaving the work area, excess contamination will be removed from the equipment and tools and left in the work areas (e.g., excavation areas).
- A decontamination area (e.g., decontamination pad) will be designated
 for cleaning all equipment that has been in contact with the Site materials
 before leaving the Site. All decontamination will be conducted on a pad
 with an impermeable synthetic liner and fluid-containment berm.
 Equipment will be placed on the pad and rinsed, brushed and/or power
 washed to remove contamination.
- Disposal of fluids generated from the decontamination process will be in accordance with approved work plans.
- Disposal of all solids collected within the decontamination pad and the pad liner will be in accordance with approved work plans.

10.0 SPILL CONTAINMENT PROGRAM

The spill contamination program for this project will involve the use of preventative measures in order to reduce the potential for environmental releases. These preventative measures will include the following:

- Equipment inspection;
- Staging equipment on containment pads;
- Secondary containment for fuel storage tanks; and
- General housekeeping practices.

If project activities involve the use of drums or other containers, the drums or containers will meet the appropriate Department of Transportation regulations and will be inspected and their integrity assured prior to being moved. Operations will be organized so as to minimize drum or container movement. Drums or containers that cannot be moved without failure will be overpacked into an appropriate container.

11.0 CONFINED SPACE ENTRY PROCEDURES

Entry into permit-required confined spaces is not anticipated. If a project task or activity would involve entry into a permit-required confined space or if there is a question as to whether or not a job task or activity involves a permit-required confined space, the PM or SSO will contact the North America H&S Leader for assistance prior to any personnel entering the confined space.

12.0 EMERGENCY RESPONSE PLAN

This section describes possible contingencies and emergency procedures to be implemented at the Site in the event of a medical emergency or spill.

The following section is intended to be consistent with the Remedial Action Contingency Plan presented in the RA Site Management Plan (which is an appendix to the RD).

The list of emergency telephone numbers presented as Table 1 in the RA Site Management Plan is also included as Appendix M to this HASP.

12.1 PERSONNEL ROLES AND LINES OF AUTHORITY

During all RD field activities, the PM will serve as the primary Emergency Coordinator. During all RA field activities, the On-Site Construction Manager will serve as the primary Emergency Coordinator. The Emergency Coordinator may assign an individual(s) to be his alternate or to assume Emergency Coordinator responsibilities in his absence.

At all times during the work, there will be at least one individual on the Site or on call (if after normal working hours) with the responsibility for coordinating all emergency response measures. The Emergency Coordinator and his alternate(s) shall be familiar with all aspects of the HASP, RA Contingency Plan, current field activities, the location and characteristics of materials handled, the overall Site layout, and proper and appropriate channels of communication/notification.

The Emergency Coordinator is responsible for training pertinent personnel on the procedures of the RA Contingency Plan.

The Emergency Coordinator is responsible for the following:

- taking appropriate measures to ensure the health and safety of site personnel and the public,
- arranging for medical treatment or first aid for any person injured or requiring medical attention,
- leading response actions to address a spill,
- evacuating personnel from the work area or the Site,
- notifying the ERM PM and appropriate authorities, and
- preparing follow-up reports.

All Site personnel will assist as directed by the Emergency Coordinator in case of an emergency.

12.2 EMERGENCY ALARMS

ERM will utilize portable air horns (or automobile car horns in absence of an air horns) to sound audible alarms. The air horns will be used to sound a general alarm to notify workers of an emergency. Employees will be trained on how to

respond to the alarm, including evacuation routes, procedures, and muster points.

Emergency alarm signals will be reviewed during the JHA and daily safety tailgate meeting, and documented in the Daily Safety Meeting Documentation Form (Appendix L).

12.3 EVACUATION PROCEDURES AND ROUTES

Whenever there is a release, fire, or explosion, the Emergency Coordinator will immediately attempt to identify the character, source, and extent of contamination, to the extent safely possible. Concurrently, the Emergency Coordinator will assess possible direct and indirect hazards to human health or the environment (on-Site and off-Site) that may result from the release, fire, or explosion. Based upon this assessment, the Emergency Coordinator will determine whether evacuation of Site personnel and local individuals is required and will immediately notify appropriate authorities (police and fire department) if necessary.

Evacuation procedures include the following:

- Notification via audible alarms The Emergency Coordinator will utilize portable air horns (or automobile car horns in absence of an air horn) to sound audible alarms.
- Assembly / rally points The default assembly point will be the Site trailer area, or as otherwise identified during the daily health and safety meeting.
- Accounting for project team members and subcontractors In the event that an emergency requires evacuation to an assembly point, the Emergency Coordinator will be responsible for reviewing the Site sign-in log to account for the presence of all project team members and subcontractors on-Site at the time of the emergency.

Since the location of the work areas will change, the evacuation routes and assembly points may need to be adjusted. In addition, evacuation routes and assembly points need to consider prevailing wind direction (i.e., evacuation routes and assembly areas should be upwind or crosswind from the work area). The location of evacuation routes and assembly points will be reviewed and documented on the Daily Safety Meeting Documentation Form (Appendix L).

12.4 RESPONDING TO EMERGENCIES

In the event an actual or suspected incident where personal injury or illness occurs, the Emergency Coordinator should take the following actions sequentially as necessary:

- Ensure conditions are appropriate to proceed with rescue;
- Don appropriate PPE;
- Remove the exposed or injured person(s) from immediate danger;

- Decontaminate affected personnel, as appropriate,
- Obtain ambulance transport to the local hospital, in the event of any injury or illness deemed by the Emergency Coordinator to require medical surveillance or treatment; and
- Evacuate other personnel until it is safe for work to resume.

12.5 REPORTING EMERGENCIES

At the earliest time practicable following the occurrence of the emergency situation, the Emergency Coordinator will contact the ERM PM to advise him of the situation. The PM will then be responsible for promptly informing the following parties about the emergency.

- Partner-In-Charge (PIC);
- Injured/involved personnel's supervisor; and
- Client Contact (Owner).

In the case of an Incident, the Emergency Coordinator, with the cooperation of the H&S Contact, will promptly begin formal documentation of and investigation into the root causes of the incident following the occurrence of the incident. This process is defined in Section 13 below.

12.6 RESTARTING WORK FOLLOWING AN EMERGENCY

The Emergency Coordinator will determine when it is safe to resume work at the Site following an emergency. Note that if there is any doubt regarding the safe condition of the area, work will not recommence until all safety issues are resolved.

12.7 EMERGENCY DRILLS

In accordance with the HAZWOPER Standard, emergency response plans will be rehearsed regularly as part of the overall training program for Site operations. The frequency of this drill (rehearsal) is outlined on Table 12-1. All drills will be documented on the Emergency Drill Evaluation Form found in Appendix K. Drills do not need to be elaborate. A table-top scenario during the daily safety meeting is an adequate drill.

TABLE 12-1: Emergency Drill Frequency

Project Duration	Drill Frequency
Less than 30 days	None, cover during review/sign-off of HASP
Greater than one month but less than one year	Once
Greater than one year	Annually

REPORTING OF SAFETY EVENTS

13.0

Safety events are occurrences or conditions that may contribute to or result in an injury, occupational illness or property damage. ERM seeks to learn from the investigation of the following types of safety events:

- Unsafe acts and unsafe conditions,
- Near misses, and
- Incidents (injury, illness, property damage, fire, or chemical spill).

All safety events must be reported promptly. Immediate verbal notification to the project PM and PIC is required, as well as entry of the event into the Event Communication System (ECS), ERM's electronic safety event reporting system, within 48 hours of the safety event occurring.

14.0 SITE SAFETY BRIEFINGS

14.1 COMMUNICATION AND REVIEW OF THE HASP

An initial review of the Site-specific HASP will be held either prior to mobilization or after mobilization but prior to commencing work at the Site to communicate HASP details and answer questions to individuals working at the site. The following topics will be addressed during the briefing.

- Names of the SSO and any designated alternate.
- Hazardous chemicals that may be encountered during on-Site activities.
- Physical hazards that may be encountered on-Site.
- Special training requirements and Safe Work Practices.
- Work tasks.
- Emergency communication signals, codes, and location of emergency contact information.
- Emergency procedures for safety events, fires, and hazardous material incidents.
- Emergency evacuation routes.

14.2 DAILY SAFETY MEETING

A daily safety meeting will be conducted each morning. The daily safety meeting will include a discussion of the following health & safety-related topics, among others:

- Who is doing what, where, and how;
- The potential for overlapping Site operations;
- Changes to the HASP or JHAs;
- · Discussion of recent Incidents or safety observations; and
- Comments from the project personnel.

The meetings will be documented on the Daily Safety Meeting Documentation Form found in Appendix \boldsymbol{L} .

AUDITING AND HASP REVISIONS

15.0

Selected project field activities and project files shall be audited periodically. A full Site audit for conformance with the HASP will occur at least once per year for projects with a field duration of 1 year or longer. Full Site audits may also be conducted for shorter duration projects. Project documentation audits may be conducted periodically for shorter term projects.

Revisions made to the Site HASP in response to audit feedback, lessons learned from Incidents, or other reasons will be explained to all Site personnel at the first daily safety meeting following the institution of the HASP revision.

Site Location Map and Map to Hospital THIS PAGE MUST BE POSTED ON-SITE

Appendix A

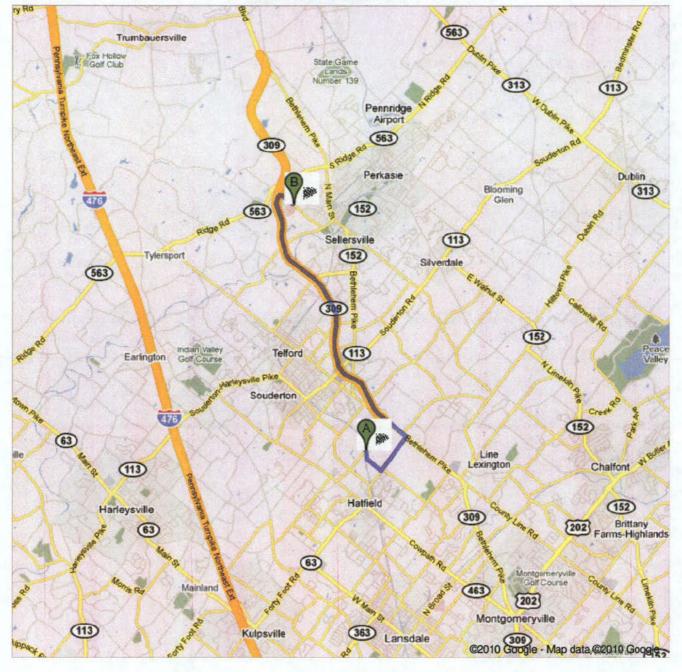
12 November 2010 Project No. 0042525 North Penn Area 2 Superfund Site Hatfield Township, Pennsylvania

Google maps

Directions to Grand View Hospital 700 Lawn Avenue, Sellersville, PA 18960-1587 - (215) 453-4000

7.4 mi – about **12 mins** EMERGENCY ROOM: 215-453-4674

General: 215-453-4000





Bergey Rd & Richmond Rd, Hatfield, PA 19440

. 1	. Head southeast on Richmond Rd toward Unionville Pike About 1 min	go 0.5 mi total 0.5 mi
ኅ ፡	. Turn left at Unionville Pike About 2 mins	go 0.8 mi total 1.4 mi
309	7. Turn left at PA-309 N/Bethlehem Pike Continue to follow PA-309 N About 8 mins	go 5.6 mi total 7.0 mi
7	. Take the exit toward PA-563/Perkasle	go 0.1 mi total 7.1 mi
L	Destination will be on the right About 1 min	go 0.3 mi total 7.4 mi

Grand View Hospital

700 Lawn Avenue, Sellersville, PA 18960-1587 - (215) 453-4000

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Map data ©2010 Google

Directions weren't right? Please find your route on maps.google.com and click "Report a problem" at the bottom left.

Job Hazard Analyses (JHAs)

Appendix B

12 November 2010 Project No. 0042525 North Penn Area 2 Superfund Site Hatfield Township, Pennsylvania



North America Job Hazard Analysis (Insert Task Name)

Project Name: From HASP
Project Number: From GMS
Job / Task Name: From title above
JHA No.: Specific number for this

site (ex. M&J-1)

FSO	Retain copy in site health & safety file, amend to HASP as necessary.
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.

s JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork specific hazards related to this task must be incorporated by the project team. Once completed, the JHA and be reviewed regularly with site personnel who will be performing this task.	

Task Description:

(Short description of task)

Hazard Analysis:

Task Step	Hazard	Control Measures
Step 1	Sentence describing hazards	Sentence describing hazard controls relating to hazards
Step 2		
Step 2 Step 3		
THE REPORT OF STREET		
CELLS TO THE RESIDENCE	Apple Section Control Control	

Personal Protective Equipment Required for this Task:

Type	Description
List each type of PPE (ex.	Describe details of PPE listed (ex. rubber gloves taped to sleeve of Tyvek)
gloves)	



North America Job Hazard Analysis (Insert Task Name)

Project Name: From HASP
Project Number: From GMS
Job / Task Name: From title above
JHA No.: Specific number for this
site (ex. M&I-1)

Training Required for this Task:

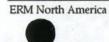
Туре	Description					
List training associated with only this JHA (ex. respirator training and fit-test for respirator use)	Describe training, who needs it, and how often. Include on-site source for training if a source exists					

Forms Associated with this Task:

Туре	Description
List forms associated with only	Describe form, including a website address on the NA H&S Minerva page
this JHA (ex. PPE inspection	
form or respirator medical	
clearance form)	

Site-Specific Job Hazard Analysis Completed by:

Name	Date



2 Form Rev.: 05-08



Job Hazard Analysis Form (Note: One Form per Job / Task)

Project Name:	North Penn 2 Superi	und Site	·					
	0042525							
	Site Survey, Initial Phase							
Project JHA No.:	001							
	<u> </u>	· · · · · · · · · · · · · · · · · · ·						
Document Routing								
SSO	Retain copy in site health & safety file, amend to HASP as necessary.							
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.							
Instructions:	uctions: Prior to conducting fieldwork a Job Hazard Analysis must be completed and reviewed with site personnel. At the time of site mobilization, the Job Hazard Analysis will be verified and reviewed again with site personnel at the beginning of each day as fieldwork continues.							
1. Job/Task Description:								
Site Survey, Initial Phase - Includes surveying and placing stakes near buildings at an active facility and in or near wetlands areas, overgrown vegetative areas, and streams.								
2. Hazard Identification:								
☐ Site Constituents of Concern		□ Overhead lines/subsurface lines	■ Vehicle traffic					
☐ Chemicals ERM will take to site		□ Electrical Shock	☐ Rotating/Moving Equipment and Pinch Points					
☐ Dust –Describe source		☐ Combustible materials, Fire, Explosion	☐ Heavy Equipment/Drill Rigs/Dump Trucks, etc					
Slips (Wet Surface), Trips and Fallsfall less than 6 feet☐ fall more than 6 feet		□ Lighting/Visibility	☐ Hazards from others working in vicinity					
■ Open water areas		☐ Lifting, Pulling, Pushing, Repetitive Motion	☐ Hazards to others working in vicinity					
■ Biological hazards		☐ Airborne/Flying Material	☐ Environmental Spill					
■ Heat/Cold Stress		☐ Falling Objects	☐ Confined Space					
☐ Noise - Describe source		Sharp Objects - phragmites	☐ Other Hazards - List:					



Job Hazard Analysis Form (Note: One Form per Job / Task)

Project Name:

North Penn 2 Superfund Site

Project Number:

0042525

Job / Task Name:

Site Survey, Initial Phase

Project JHA No.:

001

3. Hazard Analysis:

Hazard Referen SOPs					
Biological Hazards (Poison ivy/oak, insects, SOP 7		Personnel will be instructed on the visual recognition of poison ivy and known			
snakes, animals)		locations at the site. Work clothes and awareness will help prevent exposure to			
		poison ivy. If exposure is suspected, personnel will wash affected areas immediately upon exiting the Exclusion Zone.			
		Personnel may use insect repellants (with DEET) to keep away mosquitoes, gnats, chiggers, and ticks. Work clothes and long sleeves will aid in preventing exposure.			
		Body inspections after field exposure will aid in determining exposure to insects. The SSO will be informed of any tick bite that shows the suspect signs of Lyme's			
		disease (See SOP 7).			
		Personnel will practice avoidance of snakes and animals. If an encounter with an animal occurs, personnel will not approach or aggravate the animal. Personnel will avoid contact with animals where feasible.			
Phragmites		This plant is hazardous due to its sharp edges and ability to cut exposed skin. Personnel will have awareness training and wear work clothes with long sleeve			
		shirts. Avoidance of the plant will be practiced where appropriate.			
Working in/near wetland areas and small		Project site includes a wetland area. Personnel will avoid working or standing in the			
streams		stream during this activity. If necessary, personnel will not exceed a depth of water above their knees. Personnel will be aware that soft sub-grade conditions may exist.			
		The main stream on-Site can have relatively high velocity flow. The work should			
		not require going into the main stream, so entering the main stream should be avoided. Use buddy system and stay within sight of each other.			





Job Hazard Analysis Form (Note: One Form per Job / Task)

Project Name:

North Penn 2 Superfund Site

Project Number:

0042525

Job / Task Name:

Site Survey, Initial Phase

Project JHA No.:

001

4. Nearest emergency equipment to work location:

First Aid Kit		In ERM and Subcontractor vehicles, if applicable				
Fire Extinguishers		NA				
Eye Wash Station		NA				
Safety Shower	-	NA				
Other - List:	-					
			!			
,	1					



Job Hazard Analysis Form (Note: One Form per Job / Task)

Project Name:

North Penn 2 Superfund Site

Project Number:

0042525

Job / Task Name:

Site Survey, Initial Phase

Project JHA No.:

001

Hazard	Reference SOPs	Mitigation Measures
Slip/Trip/Fall		Personnel will be aware that the terrain is uneven, overgrown (in spots) and has many tripping hazards. In addition, the area is a wetlands and may have slippery surfaces. Personnel will keep their eyes focused on where they are walking and will attempt alternate pathways where a hazard exists
Heat/Cold Stress	SOP 05 SOP 06	Personnel will recognize weather conditions for the day the task is performed. This activity is not excessively stressful yet still requires attention. A work-rest regiment will be executed on excessively hot days. Personnel will be made aware to stay hydrated on hot days. For colder temperatures, personnel will wear appropriate clothing. Attention will be made for wind chill factors. A work-rest regiment will be implemented, as needed.
Vehicular Traffic - Site roads and public roads		Personnel will wear high visibility vests when working on or near Site roads or public roads or near traffic. Appropriate traffic control devices (e.g., cones) will be used where appropriate. Site vehicles (including trucks, cars, and golf carts) travel around the Site frequently.
Chemicals of concern		Site inspection and reconnaissance will not have any subsurface activities. There is no expected exposure to chemicals of concern during this activity. Personnel will practice good hygiene and universal precautions while performing this activity as contingency.

3. Exposure Monitoring - the following equipment will be used to monitor personnel exposure:

None required – task does not anticipate ERM personnel or contractors being in a situation where there is direct exposure to chemicals of concern.



Job Hazard Analysis Form (Note: One Form per Job / Task)

Construction Manageme	ent	, r y y y					•	
Project Name:		n 2 Superfund Site						
Project Number:	0042525				•			
Job / Task Name:		y, Initial Phase						
Project JHA No.:	001					· · · · · · · · · · · · · · · · · · ·		
5. PPE Require	ments	•						
5. II E Require	inches							
Field clothe	s (long or short sleeve sl	nirt long pants)		-				
□ Disposable	coveralls, specify type:	int, long parits)						•
								
		working near Site roads						
· ·	dant Clothing							
☐ Hard-hat	:							
■ Steel toe bo	•							
		oots (to protect against po	ssible LNAPL in so	oft spots				
□ Respiratory							•	
□ Half	-face cartridge respirato	r, cartridge type:		· · · · · ·	_			
☐ Cart	ridge change frequency	:		·	_			
	er respirator type:			•	_			
		ork gloves, Nitriles if har	<u>ıdling sediment</u>					
	tection, specify type(s):			-	_		:	
Eye Protecti	on, specify type: <u>sa</u>	fety glasses, or glasses wi	th side-shields		_		,	
			Job Hazar	d Analysis (Complete	d by:		
				1		•		
				Name		4	Compar	ıy
		•						•
•	•		. (b) (4)		ERM	*	
-				·/.				
				- 1		<u> </u>		
			• .		٠		Date:	April 2010
							Date.	April 2010



	North Penn 2 Superfund Site						
· ·	0042525						
	Groundwater Sampling and Liquid Level Measurements						
Project JHA No.: 0	002						
	Documen						
	etain copy in site health & safety file, amend t						
Project Manager F	etain copy in the office health & safety file, an	nend to HASP as necessary.					
	· · · · · · · · · · · · · · · · · · ·						
Instructions:	rior to conducting fieldwork a Job Haza	rd Analysis must be comp	pleted and reviewed with site personnel. At the				
t	me of site mobilization, the Job Hazard	Analysis will be verified	and reviewed again with site personnel at the				
<u> t</u>	eginning of each day as fieldwork conti	nues.	·				
•							
1. Job/Task Description:			·				
· · ·							
Groundwater Sampling and Lic	uid Level Measurements - A pre-desi	on field investigation wi	ill be conducted to gather additional data to				
support the remedial design. A	round of groundwater sampling from	n all Site wells and water	r level measurements in all Site wells and				
the intermittent stream will be o	anducted	it all offe wells and water	rever measurements in an one wens and				
the intermittent stream will be	onauciea.		·				
2 11111							
2. Hazard Identification:	<u> </u>	<u> </u>	<u> </u>				
■ Site Constituents of Concern	☐ Overhead lines/sub	surface lines	■ Vehicle traffic				
		,					
☐ Chemicals ERM will take to sit	□ Electrical Shock		☐ Rotating/Moving Equipment and Pinch				
	•		Points				
☐ Dust -Describe source	☐ Combustible materi	als, Fire, Explosion	☐ Heavy Equipment/Drill Rigs/Dump Trucks,				
			etc				
■ Slips (Wet Surface), Trips and	Falls		☐ Hazards from others working in vicinity				
■ fall less than 6 feet		•					
☐ fall more than 6 feet							
Open water areas	■ Lifting, Pulling, Pus	shing, Repetitive Motion	☐ Hazards to others working in vicinity				
■ Biological hazards	☐ Airborne/Flying Mat		☐ Environmental Spill				
■ Heat/Cold Stress	☐ Falling Objects		☐ Confined Space				
□ Noise - Describe source	Sharp Objects - phra		Other Hazards - List:				
_ Troise Describe source	- Sharp Objects - phrug	5'''''''	Outer Frazarus - List.				



Project Name:

North Penn 2 Superfund Site

Project Number:

0042525

Job / Task Name:

Groundwater Sampling and Liquid Level Measurements

Project JHA No.:

002

Hazard	Reference SOPs	Mitigation Measures
Biological Hazards (Poison ivy/oak, insects, snakes, animals)	5OP 7	Personnel will be instructed on the visual recognition of poison ivy and known locations at the site. Work clothes and awareness will help prevent exposure to poison ivy. If exposure is suspected, personnel will wash affected areas immediately upon exiting the Exclusion Zone.
		Personnel may use insect repellants (with DEET) to keep away mosquitoes, gnats, chiggers, and ticks. Work clothes and long sleeves will aid in preventing exposure. Body inspections after field exposure will aid in determining exposure to insects. The SSO will be informed of any tick bite that shows the suspect signs of Lyme's disease (See SOP 7). Personnel will practice avoidance of snakes and animals. If an encounter with an animal occurs, personnel will not approach or aggravate the animal. Personnel will avoid contact with animals where feasible.
Phragmites		This plant is hazardous due to its sharp edges and ability to cut exposed skin. Personnel will have awareness training and wear work clothes with long sleeve shirts. Avoidance of the plant will be practiced where appropriate.
Working in/near wetland areas and small streams		Project site includes a wetland area. Personnel will avoid working or standing in the stream during this activity. If necessary, personnel will not exceed a depth of water above their knees. Personnel will be aware that soft sub-grade conditions may exist. The main stream on-Site can have relatively high velocity flow. The work should not require going into the main stream, so entering the main stream should be avoided. Use buddy system and stay within sight of each other.





Project Name:

North Penn 2 Superfund Site

Project Number:

0042525

Job / Task Name:

Groundwater Sampling and Liquid Level Measurements

Project JHA No.:

002

Hazard	Reference SOPs	Mitigation Measures
Slip/Trip/Fall		Personnel will be aware that the terrain is uneven, overgrown (in spots) and has many tripping hazards. In addition, the area is a wetlands and may have slippery surfaces. Personnel will keep their eyes focused on where they are walking and will attempt alternate pathways where a hazard exists
Heat/Cold Stress	SOP 05 SOP 06	Personnel will recognize weather conditions for the day the task is performed. This activity is not excessively stressful yet still requires attention. A work-rest regiment will be executed on excessively hot days. Personnel will be made aware to stay hydrated on hot days. For colder temperatures, personnel will wear appropriate clothing. Attention will be made for wind chill factors. A work-rest regiment will be implemented, as needed.
Vehicular Traffic - Site roads and public roads		Personnel will wear high visibility vests at all times. Appropriate traffic control devices (e.g., cones) will be used where appropriate. Site vehicles (including trucks, cars, and golf carts) travel around the Site frequently.
Chemicals of concern	SOP 08	Site personnel will be using equipment that may become contaminated during groundwater sampling (pumps, tubing, etc.). Proper PPE will be worn by all site personnel to protect against any exposure. Air monitoring will be conducted within the breathing zone during the sampling event.



Project Name:

North Penn 2 Superfund Site

Project Number:

0042525

Job / Task Name:

Groundwater Sampling and Liquid Level Measurements

Project IHA No.:

002

3. Exposure Monitoring - the following equipment will be used to monitor personnel exposure:

A Photo Ionization Detector (PID) will be used during the sampling event to monitor the volatile organic compounds within the breathing zone of the field staff. Action Levels and response action requirements will be followed in accordance with Table 5-4 of the HASP.

4. Nearest emergency equipment to work location:

First Aid Kit	In ERM and Subcontractor vehicles, if applicable
Fire Extinguishers	In ERM vehicles
Eye Wash Station	NA
Safety Shower	NA NA
Other - List:	
. *	



Co	nstruction Management	F == , = , =	,	· '.
	oject Name:	North Penn 2 Superfund Site		
	oject Number:	0042525		
	/ Task Name:	Groundwater Sampling and Liquid Level Meas	urements	
Pro	oject JHA No.:	002	<u> </u>	
			. '	
_	DDE Danis	•		
э.	PPE Requirements			•
_	F:-1-1-1-1-1-1-1-1		,	•
_	rield clothes (long or sho	rt sleeve shirt, long pants)		
	Disposable coveralls, spec			•
		ve vests: if working near Site roads		
	Flame Retardant Clothing	3		
	Hard-hat			
	Steel toe boots/shoes		•	•
	Disposable shoe covers or	r rubber boots (to protect against possible	e LNAPL in soft spots)	
	Respiratory Protection	V 1 0	· · · · · · · · · · · · · · · · ·	
		e respirator, cartridge type:		
	☐ Cartridge change	frequency:		
	☐ Other respirator to	vpe:		
		Nitriles during sampling, Leather work	gloves if cutting any material	•
	Hearing protection, special		gioves in cutting any material	-
_		pe:safety glasses, or glasses with sic	la alcial da	
_	Lye I folection, specify ty	pe. <u>safety glasses, or glasses with sic</u>	ie-snieias	
			* • • • • • • • • • • • • • • • • • • •	
			Job Hazard Analysis Comple	red by:
			Name	Company
			(b) (4)	ERM

Date:

November 2010



Project Name:		
Project Number:		
Job / Task Name:		
IHA No.: 2		

	Document Routing	·
FSO	Retain copy in site health & safety file, amend to HASP as necessary.	
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.	•

Instructions:	This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork.
	site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA
	should be reviewed regularly with site personnel who will be performing this task.

Task Description:

General office work, including the office environment, workstation setup, office electrical safety, and other office-related hazards

Task Step	Hazard	Control Measures		
Entry to/Exit from Office	Depending on the weather, traversing parking lots and internal/external stairways may cause slips, trips, or falls.	Before leaving a vehicle, take a quick look around to make sure the area appears safe. Especially if you arrive at work early or stay late, be wary of anyone lingering in a parking area. In order to avoid falls, talking or texting on cell phones should be avoided as it takes focus away from path of travel.		
		In cold weather where ice and snow are present, salt or sand should be placed on main paths of travel and external steps so slip hazards are eliminated.		
		Carpets and other floor coverings that are damaged should be repaired as soon as possible.		



Project Name: Project Number: Job / Task Name: JHA No.: 2

Task Step	Hazard	Control Measures
Movement around the Office	Poor housekeeping in the office can present a variety of hazards to employees.	Keep hallways and walkways should be kept clear of obstructions or items that might cause someone to trip. Any spills or wet areas should be mopped immediately by the person causing or discovering the spill.
Eating and Drinking	Areas used to store food and drinks that are not kept regularly clean can pose food-borne illness	General clutter inside individual offices or meeting rooms, or near emergency equipment or exits can mask other hazards and cause fire extinguishers, first aid kits, and emergency exits to become unusable. Keep these areas clutter-free and do not block emergency equipment or exit doors. Keep kitchen areas clean on a regular basis, using cleaning products that will eradicate food-borne pathogens. Ensure trash bins and recycle containers are emptied on a regular
	hazards to employees.	basis.
	Food and drink stored with chemicals can become contaminated and expose employees to ingestion of chemicals.	Do not store field samples or chemicals in the same area as food or drinks.
General Storage	Improperly stored items can fall and cause injury.	Do not store heavy items on top of cabinets or file drawers. Ensure file drawers are anchored to the wall or that the heaviest items are stored in lower drawers. Heavy items should be stored where employees do not have to extend their reach to grasp them.





Project Name:	,				
Project Number:		•			
Job / Task Name:			·		
JHA No.: 2					

Using Electrically-Powered	Damaged electrical cords or overloading electrical	Electrical cords/plugs for any office equipment or kitchen
Equipment	circuits can cause fires.	equipment must not be damaged. Inspect cords/plugs
• •		regularly and if damaged cords are found, remove equipment
		from service immediately until it is repaired. Electrical tape
		cannot be used as an interim fix.
	·	Only use one electrical power strip and do not overload it.
		Only portable heaters equipped with tip-over shutoffs are
		allowed in office areas.
Lifting	Improper lifting or lifting items weighing more than	Bend your legs when lifting items from heights lower than
	50 pounds may contribute to low-back injuries.	your waist. Do not bend your back when lifting these items.
		Either use a stepladder or get help when retrieving items from
		heights over your head.
• •		
		For heavy items or items that are awkward to lift, either get
		help or use a dolly or computer cart.
Computer Work	Poor workstation arrangement and/or not taking	Follow ERM guidance for workstation arrangement presented
	sufficient breaks can contribute to ergonomic	in the "ERM Safety Program Introduction". Highlights of this
	injuries.	guidance include positioning computer monitors at or below
		eye level, using chairs that fit your body and have adjustable
-	·	armrests, and keeping the mouse close to the keyboard.
		The most important thing you can do to avoid ergonomic
		injury is to take at least a 5-minute break every hour and
		stretch or move around the office.



Project Name:
Project Number:
Job / Task Name:
IHA No: 2

Preparing for Emergencies	Preparing for fires, evacuations, and other occurrences poorly can cause significant injury or fatalities.	Fire protection equipment such as emergency alarms, sprinklers, and fire extinguishers should be installed as required by local regulations. They should be visually inspected at least monthly and services as recommended by their manufacturer. If fire extinguishers are present, employees must be trained in their use.
		In general, chemicals should not be stored in office areas. If necessary, flammable chemicals must be stored inside flammable storage cabinets and incompatible chemicals must be stored away from each other.
		A well-stocked first aid kit should be kept in a well-marked area of the office, inspected and restocked at least monthly. Emergency phone numbers should be posted nearby. At least one employee should be trained in First Aid/CPR.
		For each office location, an "Emergency Action and Fire Prevention Plan" must be prepared and practiced annually. Drills should be documented on the "Evacuation Drill Evaluation Form".
Storing Chemicals	Improper storage of chemicals could lead to employee chemical exposure, chemical spills, or fires from flammable materials.	Chemical storage in office areas is strongly discouraged. If chemicals must be stored in the vicinity of employees performing general office work, a MSDS sheet for each chemical must be kept on-file, and employees must be trained in Hazard Communication.
		Store incompatible chemicals away from each other, and always store flammable chemicals inside flammable chemical storage cabinets.





Project Name:			
Project Number:			
Job / Task Name:			
JHA No.: 2			
Personal Protective Equipment	Required for this Task:		
Type	Description		
None			
Training Required for this Tasl	k:		
Type	Description		
None			
Forms Associated with this Tas	sk:		
Type	Description		
ERM Office Inspection Form	Form designed to be used to evaluate health and safety in ERM permanent and short-term field office		
	locations. At least once per year this form must be completed by each office location.		
	parameter parame		
Emergency Action/Fire	Flipchart posted in various areas of ERM permanent office locations describing what employees must		
Prevention Plan	do if/when different types of emergency situations occur.		
Trevention Than	do n/ when university per of energency blundons occur.		
Evacuation Drill Evaluation	Documentation of the acceptability of ERM personnel response to fire drills, evacuations, or other		
Form	types of emergency simulations. At least once per year this form must be completed by each office		
Tom			
	location.		

Site-Specific Job Hazard Analysis Completed by:

Name	Date	
	·	



Project Name:
Project Number:
Job / Task Name:
JHA No.: 5

	Document Routing	
FSO	Retain copy in site health & safety file, amend to HASP as necessary.	
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.	·

	This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork, site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA should be reviewed regularly with site personnel who will be a significant to the standard of the project team.
	should be reviewed regularly with site personnel who will be performing this task.

Task Description:

Operating vehicles for work, including personal vehicles, company-owned vehicles, and rental vehicles

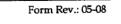
Task Step	Hazard	Control Measures
Inspect the Vehicle	Tire pressure, brakes, steering, headlights and other vehicle equipment malfunction can contribute to vehicle accidents and property damage. Loose articles inside the vehicle and carried in truck beds or on trailers can shift and cause distractions or	Use the "ERM Vehicle Safety Form" to document daily inspections of the vehicle. In certain cases, a client-required form may be used instead. Do not operate any vehicle if its safety is in question. During vehicle inspection make sure any loose articles either
	traffic accidents.	inside the vehicle or in truck beds/on trailers are well-secured.
Get in and out of the Vehicle	Hands, hair, or loose clothing can be caught in doors, trunk covers, and other vehicle equipment, causing injury.	When entering or exiting a vehicle, pay attention to what you are doing. ERM has had incidents occur simply from being rushed and not paying attention during vehicle entry/exit.
Drive the Vehicle	Operating a vehicle presents many different hazards to employees that must be simultaneously mitigated.	Before moving vehicles always put your seat belt on, and stop using handheld electronics. Make sure any food or drink is secured and any electronics are programmed (GPS).
		When moving vehicles, follow all posted speed limits and posted signs. Do not pick up hitch-hikers, and never transport people in truck beds.



Project Name: Project Number: Job / Task Name: JHA No.: 5

Task Step	Hazard	Control Measures	
Driving when Fatigued	Operating a vehicle after a full day of work or when you are fatigued drastically decreases focus and response time, and increasing the risk of being involved in a vehicle accident.	Avoid driving more than 8 hours in one workday. If the number of hours driving to/from a jobsite combined with the number of hours to be worked on the site will equal more than 14 total hours, alternate arrangements should be arranged. Be aware of your fatigue level while driving and stop to rest if you feel overly tired.	
Stay Focused on the Road Doing anything that distracts you from the road for more than 2 seconds highly increases the risk of being involved in a vehicle accident. In particular, driver inattention due to hand-held mobile phone use is currently thought to be responsible for approximately 80% of all vehicle accidents.			
Pull a Trailer	Many drivers are unfamiliar or inexperienced with pulling trailers, increasing the risk of being involved in a vehicle accident.	If you are uncomfortable pulling a trailer do not do so. Arrange for an alternate, experienced driver. Be aware that it takes longer to speed up and slow down when pulling a trailer, and that visibility may be reduced significantly. Make sure your vehicle is capable to pull the weight of the trailer and its contents. Inspect the trailer to ensure brake and turn signals work properly and in concert with the main vehicles signals, and that tire pressure is acceptable. Make sure trailer is attached securely to the main vehicle and the safety chain or other backup attachment device is in-place. Evenly distribute weight on any trailers pulled.	





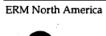


Project Name:
Project Number:
Job / Task Name:
IHA No. 5

Task Step	Hazard	Control Measures	
Leaving the Vehicle	Leaving personal valuables and company	Turn off the engine and lock any vehicle being left for ever	
1	equipment/documents in abandoned vehicles may	short period of time when not on a secure jobsite. If the	
	attract thieves.	vehicle will be left for long periods or overnight, remove any	
		company documents, computers, and equipment, personal	
		valuables, or any items that would attract thieves.	
Report and Document Vehicle	Improper documentation of vehicle accidents and	No matter how minor a vehicle accident or property damage	
Accidents and Property	property damage caused by vehicle operation place	event is, report it as a safety event.	
Damage	ERM at risk.		
• •		If involved in a vehicle accident, always call the police so a	
		report will be available, to protect your liability, and to protect	
		ERM liability. Take as many pictures as you can of the	
		accident scene if you can do so without placing yourself in	
		further danger.	
Drive a Commercial Vehicle	Driving vehicles alone or in combination (with a	Check the plaque on the inside of the driver-side door for the	
	trailer, for example) with Gross Motor Vehicle	GMVW. If the weight is greater than 10,000 pounds contact a	
•	Weight (GMVW) greater than 10,000 pounds carries	member of the North America Safety Team for further	
·	additional regulatory requirements. Not addressing	assistance. Do not operate the vehicle unless you have	
· ·	these requirements places ERM at risk.	received proper training and have required supplies (such as	
		logbooks).	
Rent a Vehicle	Only certain car rental agencies have negotiated	If possible, rent vehicles using the Cain Travel website, and	
	contracts, rates, and insurance coverage with ERM.	from an ERM authorized car rental agency. If not possible to	
	Renting a vehicle from another agency exposes you	rent from one of these, you must purchase collision damage	
	and ERM to unnecessary liability and risk.	and personal accident insurance at the time of rental.	
		Currently, authorized rental car agencies include:	
•		Enterprise Car Rental	
		Hertz Car Rental	



BKW	<u> </u>		
Project Name:			
Project Number:		•	
Job / Task Name:			
JHA No.: 5			
Personal Protective Equipment	Required for this Task:	· · · · · · · · · · · · · · · · · · ·	
Type		Description	
Vehicle Safety Kit for Personal	Includes small fire extinguisher (ABC)), first aid kit, spare tire/jack, jum	per cables, flashlight, flares or
or Company-Owned Vehicles	lighted triangles, reflective vest, and d	lisposable or digital camera (for de	ocumenting accidents)
Training Required for this Task	:		
Type		Description	
ERM Safe Driving	E-learning course instructing employees on ERM vehicle safety policy and practice.		
		,	
Forms Associated with this Task	k:		
Type		Description	
ERM Vehicle Safety Form	Includes items that should be inspected regularly on motorized vehicles.		
		1. 11.	
•		Site-Specific Job Hazard Analys	is Completed by:
•			• •
		Name	Date
			•
•			·
			•





Project Name:	
Project Number:	
Job / Task Name:	
JHA No.: 3	

	Document Routing	
FSO	Retain copy in site health & safety file, amend to HASP as necessary.	
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.	•
	The state of the s	

ĺ	Instructions:	This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork.
	·	site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA
l		should be reviewed regularly with site personnel who will be performing this task.

Task Description:

General guidelines for working safely in facilities where active operations are occurring and other personnel are performing work

Task Step	Hazard	Control Measures
Plan ahead for the site visit	Operational and safety items unplanned for prior to visiting the site can cause significant delay	Know ahead of time where any specific parking and entry locations are, as well as training or drug testing required prior to site entry. Ask your site contact/escort to explain any preentry requirements.
		Have the following personal protective equipment with you and wear it while working: • Steel-toe boots • Long pants • Safety glasses • Hard hat • Safety goggles (if splash hazards exist) • Chemical resistant gloves (if needed)



Project Name: Project Number: Job / Task Name: JHA No.: 3

Task Step	Hazard	Control Measures
Perform Site Work	Employees may encounter moving	Be aware of traffic patterns on the site, including designated
1.1	vehicles/trucks/forklifts.	forklift lanes.
	Employees may be exposed to chemicals.	Include chemicals known to pose health risks in your WARN HASP for the site, and determine their exposure limits.
	There may be uneven terrain, unguarded holes or wall openings, and other slip, trip, and fall hazards.	For any fieldwork, wear steel-toe boots with enough ankle support. If an area is overly cluttered, poorly lit, or posted signs indicate these hazards, avoid the area if possible.
	A site emergency may happen while you are working onsite.	List the facility emergency planning information in the WARN HASP and have a copy of it with you at all times. Stay with your site escort at all times.
	You may encounter confined spaces.	If you encounter posted signs stating "DANGER - Confined Space - Do Not Enter", do not enter the space. Be alert to other areas where entry or exit appears to be limited.
	High noise levels may be present.	If a noise dosimeter is not available, use the following rule of thumb. If you are standing close to another person and have to raise your voice to be understood by them, hearing protection is needed.
	Highly mechanized equipment may be present in the area, posing electrical hazards and pinch hazards.	Do not touch plant equipment unless you verify it is not powered and permission has been given to you.



ERM North America



Task Step	Hazard	Control Measures
Working Alone	Any injury or illness that occurs to an employee working alone can become very serious if they are not able to reach another person for assistance.	If a Level 2 or 3 WARN HASP has been prepared, do not work alone.
		If working alone is authorized, establish a communication plan in your WARN HASP and follow it completely. Also stay in close communication with your site contact/escort.
		If you become ill or injured when working alone, immediately call 911 for serious emergencies, or WorkCare's Incident Intervention service for other types of illnesses or injuries. The WorkCare Incident Intervention phone number is 1-800-II-XPRTS. Know the contact information and route to the nearest medical facility.

Personal Protective Equipment Required for this Task:

T TOTAL TOTA		
Type	Description	
None		

Training Required for this Task:

Truming required for this rask		
Type	Description	
None		

Forms Associated with this Task:

Description Checklist covering items associated with working in active facilities. The checklist may be used to perform pre-job risk assessment.	
Wallet-sized card to be carried by all ERM employees containing contact information for the Incident Intervention service.	



Project Name:		
Project Number:		
Job / Task Name:	•	
JHA No.: 3		

WorkCare Incident Intervention
Wall Poster

11" x 17" poster containing contact information for the Incident Intervention service. This poster should be displayed in each permanent office location and in short-term field office locations.

Site-Specific Job Hazard Analysis Completed by:

Name	Date







Project Name:
Project Number:
Job / Task Name:
IHA No.7

	Document Routing		
FSO	Retain copy in site health & safety file, amend to HASP as necessary.		٠.
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.	·	

This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork.
site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA
should be reviewed regularly with site personnel who will be performing this task.

Task Description:

General guidelines for working safely when performing any ground penetrating activities (excluding surface soil sampling) and ERM personnel activities during overseeing excavations.

Task Step	Hazard	Control Measures
Identify a Client Contact	Client contacts that are not familiar with the site	Determine degree of knowledge of our client contact by
Person	layout could cause critical information to be missed	evaluating their current job duties at the site, length of time
	during safety planning.	they have worked at the site, and time in their current job. If
		the ERM team does not feel comfortable with the level of
		experience of our client contact, take additional measures to
		ensure all pertinent subsurface utilities and services
		information is gathered.
Engage Subcontractors	Subcontractors who have not been evaluated	Use only ERM subcontractors who are identified as having
	against ERM minimum safety standards or who do	met our minimum safety standards. In cases where using an
	not meet minimum safety standards may pose more	already-qualified subcontractor is not possible, ensure extra
	risk.	precautions are taken to provide safety oversight to the work.
Appoint an ERM Subsurface	ERM employees who are not experienced with SSC	Ensure a "SSC Experienced Person" is assigned to the project
Clearance "Experienced	issues may not recognize critical zones or clues to	to provide oversight of ground penetrations and to mentor
Person" to the project	other site utilities/services.	less experienced ERM employees.



Project Name: Project Number: Job / Task Name: JHA No.: 7

Task Step	Hazard	Control Measures
Gather site-specific subsurface	Incomplete or inaccurate site utility/service	Obtain the most recent "as-built" drawings and additional site
information	drawings may lead the ERM project team to	information such as easements, rights-of-way, historical plot
	incorrect conclusions regarding what	plans, etc. to assist making decisions about other actions that
	utilities/services are onsite.	will be required at the site.
Develop the HASP	Using incorrect documents in safety planning may	A Level 2 WARN HASP for Intrusive Work (minimum) must
	lead to not considering all pertinent information.	be used when performing any ground penetrations, with the
		exception of surface soil sampling. The Level 2 HASP
		contains a "Site Services Model" that ERM uses to evaluate
· · ·	.,	SSC hazards.
Develop the Site Services	Critical zones and a whole-site view of utilities and	Use the Site Services Model to identify gaps in knowledge
Model	services at the site are more difficult to do if not put	from all drawings and other verbal information from our
	into the Site Services Model.	client contact. Identify locations of key isolation and shutoffs
· · · · · · · · · · · · · · · · · · ·		closest to the work area for each type of utility/service.
Make Preliminary	Not recognizing or identifying critical zones poses	Establish critical zones and excavation buffers for the work.
Determinations	great hazard to ERM employees in the field from	Initial critical zone determinations may change in the field but
	contact with electricity or other utilities.	are a good starting point in hazard identification.
Identify Preliminary Ground	Planning ground disturbance locations inside	Ensure excavation buffers have been identified using the Site
Disturbance Locations	critical zones poses great hazard to ERM employees	Services Model and then identify locations outside those
	in the field from contact with electricity or other	critical zones up-front, if possible. If a ground disturbance
	utilities.	inside a critical zone is absolutely necessary, notify the site
		PIC and obtain guidance from him/her before proceeding.
Public and/or Private Utility	Not having utilities marked may lead to a	Contact public and private utility markout services giving
Markout	subsurface clearance strike.	them enough time to respond. A minimum of 24-hour
•		notification to utility locators is required in most states, and
		may vary higher in some states.
Conduct the Site Walk	Inexperienced people conducting the site walk may	The "SSC Experienced Person" must lead the site walk and
	miss pertinent information regarding utilities	should be accompanied by our client contact. Each ground
	and/or services.	disturbance location should be approved by our client contact
•		(written approval preferred, verbal approval acceptable).





Project Name:
Project Number:
Job / Task Name:
THA No. 7

Task Step	Hazard	Control Measures	
Inspect Each Ground Disturbance Location	Inexperienced people conducting inspection may miss pertinent information regarding utilities and/or services.	The "SSC Experienced Person" must lead inspection of each Ground Disturbance Location. Any visual clues of subsurface obstruction/utilities should be documented. Critical zones may have to be reassessed at this point. Use the SSC Checkle to document this inspection for each point inside a critical zone, at a minimum.	
Finalize Critical Zone Determinations	Not performing this verification step in the field may lead to a SSC strike.	Use information gathered during pre-planning, utility markout, and site walk/inspection to verify critical zones that have been previously established. Revise critical zones as necessary. Use the SSC Checklist to document points inside critical zones.	
••		If points are confirmed inside critical zones, either step out and relocate the ground disturbance location, or contact the PIC for additional guidance.	
Establish Excavation Buffers	Mechanical digging near subsurface structures not already designated for removal can expose employees to electrical or other serious hazards.	For at least 2 feet in all directions from an identified subsurface structure, use non-conductive tools and physically remove soil.	
Notify Equipment Operators where Excavation Buffers are Located	Mechanical digging near subsurface structures not already designated for removal can expose employees to electrical or other serious hazards.	If physically clearing is performed, use cable avoidance tools at each location that must be physically cleared (OSHA requirement). If using a hand-auger, ensure insulated handles are in-place before their use.	
		DO NOT DIG INSIDE AN EXCAVATION BUFFER WITH MECHANICAL EQUIPMENT.	

Personal Protective Equipment Required for this Task:

Type	Description	
Insulated hand-augers	Hand-augers fitted with rubber handles, or other non-conductive material.	



Project Name:			
Project Number:			
Job / Task Name:	•		
JHA No.: 7			

Training Required for this Task:

Type	Description
SSC Classroom Training	Initial classroom training detailing the ERM subsurface clearance process, tools, and forms.
SSC Experienced Person	At least one must be present on all sites involving SSC. The Experienced Person will both give SSC
	expertise in project execution and mentor less experienced employees.

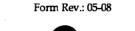
Forms Associated with this Task:

Type	Description			
SSC Checklist	Checklist detailing the ERM SSC process, and providing tools to ensure critical zones and excavation buffers are properly identified and validated in the field.			
SSC Mentorship Card	The SSC Mentorship Card provides Experienced Persons with topics to be covered with less experienced employees on SSC sites, and also documents mentoring of the less experienced employees.			
Daily Excavation Inspection Form	Form required to be used by ERM subcontractors to document daily inspection of excavations. Completed forms should be kept with the HASP and filed in project files.			

Site-Specific Job Hazard Analysis Completed by:

Name				Date		
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North America Job Hazard Analysis Work in High Noise Environments

Project Name:
Project Number:
Job / Task Name:
IHA No: 8

	Document Routing	
FSO	Retain copy in site health & safety file, amend to HASP as necessary.	
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.	1
<u> </u>		

	This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork.
	site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA
	should be reviewed regularly with site personnel who will be performing this task.

Task Description:

Guidelines for safe work in any environment with elevated noise levels.

Task Step	Hazard	Control Measures
Prepare for Work	Not having hearing protection or noise monitoring equipment could expose employees to unknown levels of elevated noise.	For work environments known or suspected to present elevated noise hazards, ensure hearing protection is procured and available at the jobsite. For any employee working on the site who has not attended hearing conservation training within the past year, review this JHA with them and document their training.
		Determine whether noise monitoring has been done on other projects with similar scopes of work by contacting your Safety Team representative. If work on the project will last 30 days or more, procure a noise dosimeter and perform personnel monitoring at the site to document noise levels.
Conduct the Work	Damage to hearing from sustained elevated noise or intermittent impact noise.	If noise dosimetry is not being conducted at the project, use the following rule of thumb to determine whether hearing protection is required: If you are standing within 3 feet of another person and have to raise your voice to be understood by them when talking, hearing protection must be worn.



North America Job Hazard Analysis Work in High Noise Environments

Project Name:		
Project Number:	·	
Job / Task Name:		
JHA No.: 8		
Task Step	Hazard	Control Measures
Report Dosimetry Monitoring	Lack of consolidated noise dosimetry monitoring	OSHA allows noise dosimetry monitoring results collected
Results	results can result in other employees on different	when working with specific equipment to be used on any
	projects not being aware of typical noise levels.	other project site where the same equipment is in-use. Report
		dosimetry monitoring results to your Safety Team
·	· .	representative so they can be included in a North America-
	.*	wide listing of typical noise levels.
	· · · · · · · · · · · · · · · · · · ·	
Personal Protective Equipme	ent Required for this Task:	
Type	,	Description
Hearing Protection		
		,
Training Required for this T	ask:	·
Type		Description
Hearing Conservation		
0		
Forms Associated with this 7	Fack:	
	l dSK.	Description
Type		Description
None		

Site-Specific Job Hazard Analysis Completed by:

Name		Date	
·			



2



Project Name:
Project Number:
Job / Task Name:
IHA No.: 9

	Document Routing	
FSO	Retain copy in site health & safety file, amend to HASP as necessary.	
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.	

		This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork.	-,-
		site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA	
١	·	should be reviewed regularly with site personnel who will be performing this task.	

Task Description:

Guidelines for managing safety of ERM-hired subcontractors to ensure they work safely and ERM liability is minimized.

Task Step	Hazard	Control Measures
Choose Subcontractor to Perform Work	Lack of executed contractual documentation may increase ERM liability.	The project PIC and/or PM must ensure a signed, executed contract is in-place prior to subcontractors performing work on the jobsite for ERM.
	Insurance documents collected during the safety prequalification process may not be sufficient to meet specific client contractual requirements.	The project PIC and/or PM must ensure that insurance certificates on-file for subcontractors meet or exceed contractual insurance requirements mandated by ERM clients. If the insurance certificate on-file is out-of-date or does not represent sufficient coverage, the project PIC and/or PM must obtain an updated insurance certificate from the subcontractor prior to the subcontractor performing work on the jobsite for ERM.
	Selecting subcontractors that do not meet ERM minimum safety criteria can result in poor safety performance on ERM projects.	Consult the North America "Subcontractor Information" page and select a subcontractor that meets ERM minimum safety criteria. If selection of an already-prequalified subcontractor is not possible due to business considerations or client wishes, provide enhanced subcontractor oversight on the jobsite.



Project Name: Project Number: Job / Task Name: JHA No.: 9

Task Step	Hazard	Control Measures
Prepare Site HASP Documents	Not informing ERM-hired subcontractors of ERM safety requirements for their work may expose employees to hazardous conditions and cause unnecessary project delays.	The project PIC and/or PM must ensure the subcontractor has received a copy of the ERM HASP and supporting documentation prior to mobilization to the jobsite. The subcontractor must be made aware that their personnel must follow provisions in the ERM HASP at a minimum, but that they may not rely on ERM documents for their employee's health and safety protection.
	Not obtaining authorized subcontractor signatures on ERM HASPs may expose ERM to additional liability.	Prior to any jobsite work proceeding, obtain the signature of an authorized representative for the subcontractor on the ERM HASP. Also, have the subcontractor's authorized representative designate one of their employees, by name, to serve as the jobsite contact for ERM safety concerns. List the jobsite safety contact in the ERM HASP.
	The lack of a specific scope of work for an ERM subcontractor opens the possibility of whether ERM or the subcontractor is responsible for certain aspects of jobsite work.	Specify both the ERM and the subcontractor's scope of work in the ERM HASP document. Ensure that any subcontractor personnel on-site has reviewed and signed the site HASP.
	Any ERM attempt to author safety documents for use during completion of tasks on jobsites by subcontractors may not be sufficient to fully control site safety hazards posed by subcontractor work.	In all cases, require the ERM subcontractor to either develop their own site-specific HASP, or develop Job Hazard Analyses (JHA) for the specific tasks they will perform. Attach these documents to the ERM HASP as appendices.







Project Name:
Project Number:
Job / Task Name:
JHA No.: 9

Task Step	Hazard	Control Measures		
Conduct the Work	On jobsites where ERM uses subcontracted services,			
Conduct the Work	additional liability arising from the OSHA "Multi- Employer Worksite Rule" may be present.	Ensure subcontractor work is overseen by ERM personnel at all times. Whenever subcontractor personnel are present on a jobsite performing work, an ERM employee should be present and engaged in the work being performed.		
		Always include subcontractor personnel in daily jobsite tailgate safety meetings and have them indicate their presence and understanding of the information presented by signing the ERM form documenting the meeting.		
		ERM personnel at the jobsite should perform regular safety inspections of the site, including subcontractor activities. Any deficiencies noted during inspections should be forwarded to the subcontractor's jobsite safety contact for resolution and report-back to ERM. For imminent danger situations (those that may cause loss of life or limb), the ERM inspector should stop the subcontractor's work and ensure all on site retreat until the imminent danger hazard is abated.		
		Do not supply subcontractor personnel with personal protective equipment (PPE). If PPE must be provided to subcontractors, ERM personnel must inspect the PPE and document the inspection prior to providing it to subcontractor personnel.		
		If ERM is performing air monitoring for the subcontractor, ensure calibration of air monitoring equipment is done before and after each use. At a minimum, air monitoring equipment must be calibrated at least once per day. Document equipment calibration and file with the site HASP.		



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Project Name:			-
Project Number:			
Job / Task Name:	•		
JHA No.: 9			

Task Step	Hazard	Control Measures
After Job Completion, Forward	Obtaining services from subcontractors who have	Submit any comments about the subcontractor's safety
Comments to ERM North	met ERM minimum safety criteria but have	performance while working on the ERM jobsite to the ERM
America Safety Team	performed poorly on jobsites poses risk to ERM	North America Safety Team. These comments will be stored
	employees on future jobsites.	in our database and provided to ERM PICs and/or PMs
		seeking quality subcontractors for future work.

Personal Protective Equipment Required for this Task:

Type	Description
None	
-	

Training Required for this Task:

Type	Description	:
None		

Forms Associated with this Task:

Type	Description
Subcontractor Safety	ERM form given to subcontractors that collects information necessary to determine whether the
Prequalification Checklist	subcontractor meets ERM's minimum safety criteria.
Subcontractor Insurance	Subcontractor-supplied form issued by the subcontractor's insurance carrier or broker evidencing
Certificate	current insurance coverage.

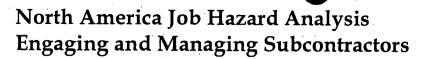
Site-Specific Job Hazard Analysis Completed by:

Name	Date



ERM North America





Project Name:	•				
Project Number:					
Job / Task Name:					
JHA No.: 9					



North America Job Hazard Analysis Hazard Communication

Project Name:
Project Number:
Job / Task Name:
IHA No.: 10

	Document Routing
FSO	Retain copy in site health & safety file, amend to HASP as necessary.
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.

Instructions:	This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork.
	site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA
	should be reviewed regularly with site personnel who will be performing this task.

Task Description:

Guidelines for communicating hazards posed by the storage and/or use of chemicals.

Task Step	Hazard	Control Measures
Storing Chemicals in the Office	Chemicals stored in ERM offices or Field Project	If at all possible, do not store chemicals in the office
Setting	Offices may lead to employee chemical exposure,	environment.
	chemical spills, or fires from flammable materials.	
		For each chemical product used by ERM employees or stored in an ERM field or office location, a MSDS sheet must be obtained and kept on-file. A chemical inventory list must be prepared and updated as new or different chemicals are procured. Chemical containers must be labeled in accordance with OSHA regulations.
		Train all employees who will use or be present in the general vicinity of chemicals annually about hazard communication. If new or updated chemicals are procured, hazard communication training must be given to affected employees prior to using or storing the chemical.



North America Job Hazard Analysis **Hazard Communication**

Project Name:
Project Number:
Job / Task Name:
JHA No.: 10

Task Step	Hazard	Control Measures
Using Chemicals	Employees may be exposed to chemical hazards via	Before using any chemical, make sure a jobsite WARN Health
	skin contact, ingestion, inhalation, or punctures in	and Safety Plan (HASP) has been prepared and taken the
	the skin.	chemical being used into account. Wear protective equipment
		as specified in the HASP.
		' · · · · · · · · · · · · · · · · · · ·
		If chemicals are being used by subcontractors, ensure all
		employees on the jobsite have been told about the chemical in-
		use and are protected.
		· ·
		If chemical exposure occurs, even if medical symptoms are not
		present, inform the Field Safety Office or Office H&S Contact.
Large Chemical Spills	Large chemicals spills may expose employees to	For large chemical spills (generally anything larger than 1
	significant health hazards.	gallon in size), HAZWOPER training is required to perform
•		any action other than retreating from the area and contacting
		appropriately-trained personnel to mitigate the spill. Do not
		attempt to stop or clean-up a spill without current
	•	HAZWOPER training, current medical clearance, current
		respirator training, and a current respirator fit-test.

Personal Protective Equipment Required for this Task:

Type	Description	,
None		

Training Required for this Task:

Training Required for this rask.		-
Type	Description	l
Hazard Communication	An annually-required training discussing general chemical hazards, MSDS sheets, and how to respond	1
	to general chemical emergency situations.	







North America Job Hazard Analysis Hazard Communication

Project Name:	
Project Number:	
Job / Task Name:	٠
JHA No.: 10	

Forms Associated with this Task:

Type	Description
Material Safety Data Sheet	An informational document containing information about chemical composition, hazardous
(MSDS)	properties, and steps to take in emergency situations involving chemicals.
International Chemical Safety	A chemical-specific document developed by the National Institute of Occupational Safety and Health
Card	providing abbreviated information similar to a MSDS.

Site-Specific Job Hazard Analysis Completed by:

Name	Date



North America Job Hazard Analysis Airborne Contaminants and Reproductive Hazards

Project Name:			
Project Number:			
Job / Task Name:			
JHA No.: 11			
	Docum	ent Routing	
FSO	Retain copy in site health & safety file, amen	nd to HASP as necessary.	· , ·
Project Manager	Retain copy in the office health & safety file	, amend to HASP as necessary.	
Instructions:	This JHA has been developed and app site-specific hazards related to this tas should be reviewed regularly with site	k must be incorporated by t	a Safety Team. Prior to conducting fieldwork. he project team. Once completed, the JHA forming this task.
Task Description:			
Description of specific chem	nical air contaminants requiring addition	nal regulatory actions.	
Hazard Analysis:			
Task Step	Hazard		Control Measures



North America Job Hazard Analysis Airborne Contaminants and Reproductive Hazards

Project Name:
Project Number:
Job / Task Name:
THA No.: 11

Task Step	Hazard	Control Measures
Exposure to specific OSHA- regulated chemical hazards	Certain chemicals have been found to present more significant long-term health hazards to employees	If the following chemicals are being used on a jobsite, and work will occur for more than 30 consecutive days, OSHA
during work	when they are exposed to them, including	regulations generally require a plan to mitigate exposures,
	sensitization, development of certain cancers, and others.	 additional training, and medical monitoring in some cases. 13 carcinogens (see 29 CFR 1910.
	outers.	Asbestos
		Vinyl chloride
		Inorganic arsenic
		Lead
		Hexavalent chromium
		Cadmium
· · · · · · · · · · · · · · · · · · ·		Benzene
		Coke oven emissions
•	·	1,2-dibromo-3-chloropropane
		Acrylonitrile
	·	Ethylene oxide
		Formaldehyde
	·	Methylenedianiline
•		1,3-butadiene
		Methylene chloride
Exposure to reproductive	Certain chemicals have been found to affect the	Chemicals posing reproductive hazards will be specified in
chemical hazards during work	reproductive systems in males and females and	site-specific HASPs. Follow all provisions of the HASP to
	require additional personnel protection if used.	minimize or eliminate exposure to reproductive hazards.

Personal Protective Equipment Required for this Task:

Type	Description
Varies	PPE varies depending on the specific chemical being used. Consult the HASP for jobsite-specific
	guidance.





North America Job Hazard Analysis Airborne Contaminants and Reproductive Hazards

Project Name:	
Project Number:	
Job / Task Name:	
JHA No.: 11	
Training Required for this	Task:
Type	Description
Varies	Training that must be given to employees varies on the specific chemical being used. Consult the
	HASP for jobsite-specific guidance.
Forms Associated with this	Task:
Type	Description
None	

Site-Specific Job Hazard Analysis Completed by:

Name	Date
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North America Job Hazard Analysis Natural Hazards

Project Name:		
Project Number:		
Job / Task Name:		
IHA No.: 12		

	Document Routing	
FSO	Retain copy in site health & safety file, amend to HASP as necessary.	
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.	·

Instructions:	This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork.
	site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA
·	should be reviewed regularly with site personnel who will be performing this task.

Task Description:

Guidelines for mitigating natural hazards such as poisonous animals and plants, and terrain-related hazards.

Task Step	Hazard	Control Measures
Performing fieldwork in the presence of various natural hazards	Exposure to natural hazards can lead to injuries such as twisted ankles or to more complex medical emergencies such as poisonous plant or insect encounters.	Identify the expected types of natural hazards during the safety planning/HASP-writing stage of a project and verify conditions once onsite. If conditions differ, put protective steps in-place to mitigate the natural hazard if possible.
		Mitigation of natural hazards may involve removal of the hazard prior to work beginning, or avoiding the hazard during work.
Working around poisonous plants	Poisonous plant exposure	Poison ivy, oak, and sumac are common in North America and should be avoided. For sites with these hazards present, have a poison ivy wash available for employees on-site. If
		exposure occurs and no poison ivy wash is available, employees should wash in cool water and use soap.



North America Job Hazard Analysis Natural Hazards

Project Name: Project Number: Job / Task Name: JHA No.: 12

Task Step	Hazard	Control Measures
Working around poisonous	Danger to health from bites, stings, and/or disease	Liberally use insect repellant containing DEET at all times on
insects	transmission	the jobsite. Periodically throughout the day and at the end of
		the day, perform a thorough "tick-check" to ensure ticks or
		other insects are found and removed promptly.
		Avoid obvious conical mounds of dirt that may indicate ants,
•		wasps, or other flying insects.
		Before reaching into dark or damp spaces such as monitoring
		well-heads, inspect the area thoroughly to ensure spiders are
		not present.
•		
		Always take a shower as soon as possible after leaving a
•		jobsite for the day to remove any insects, such as chiggers.
Working around snakes	Snake bites and potential poisoning	Visually inspect the work are prior to beginning any work to
		located areas with high grass and underbrush. Do not walk
•		through these areas if at all possible to avoid snakes. Wear
		leather steel-toe boots and snake chaps in areas where snakes
		are suspected or confirmed to be present. Do not attempt to
·		kill snakes, as people are commonly bitten attempting this.
Working around feral animals	Animal bites and possible transmission of disease	High rat populations within an enclosed space present a
		hazard of Hanta virus. Spray such areas with bleach solution
		prior to performing any work in the area (10 parts water to 1
	,	part household bleach).
		Feral dogs may become aggressive, especially if guarding
		their young or if they become very hungry. If dogs or other
•	· ·	animals are spotted that are acting strangely, do not approach
		them. Contact the local animal control center for assistance.







North America Job Hazard Analysis Natural Hazards

Project Name:
Project Number:
Job / Task Name:
IHA No · 12

Task Step	Hazard	Control Measures
Working on uneven terrain	Slip, trip, and fall injuries may occur when working on uneven terrain or terrain with holes	At a minimum, wear ankle-height steel-toed boots when working on project sites. Keep work areas free from clutter so
		that ground surfaces can be easily seen by employees. Do not read phone emails or text while walking.
		Identify all scattered materials presenting a slip, trip, or fall hazard with high visibility paint markings if possible, or cordon the area off with caution tape.
		Keep all heavy equipment as low to the ground as possible when being stored, such as forklift tines, excavator buckets, etc.
		Place ladder bases on even, non-slippery ground. If this is not possible obtain help when going up or down the ladder.

Personal Protective Equipment Required for this Task:

Type	Description
Ankle-height boots	ERM standard steel-toe boot requirement specified ankle-height, chemical-resistant boots.
Snake chaps	Chaps worn to prevent snakebites in areas with known high concentrations of snakes.

Training Required for this Task:

8 1	 <u> </u>
Type	Description
None	

Forms Associated with this Task:

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Type	Description
None	

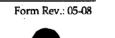


North America Job Hazard Analysis Natural Hazards

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Project Name:					•	_
Project Number:	,					
Job / Task Name:						
JHA No.: 12	4					

Name	Date
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North America Job Hazard Analysis Work On or Near Public Roadways

Project Name:
Project Number:
Job / Task Name:
IHA No.: 32

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	Document Routing	
FSO	Retain copy in site health & safety file, amend to HASP as necessary.	
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.	

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Instructions:	This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork.
	Site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA
	should be reviewed regularly with site personnel who will be performing this task.

Task Description:

Work on or near active parking lots and public and private roadways.

Task Step	Hazard	Control Measures
Offsite Preparation	Not having the proper safety equipment when needed on a project site.	When developing the health and safety plan, include specific equipment needs known at the time to ensure it is available for use at the site.
Exclusion zone setup	A vehicle may enter the work area and cause an employee injury or property damage if traffic is not channeled away by using protective guarding.	Setup a channeling devices consisting of cones, tubular markers, vertical panels, drums, barricades or temporary raised islands. See the Manual on Uniform Traffic Control Devices (MUTCD) for more information and consult your local H&S leader for guidance.



North America Job Hazard Analysis Work On or Near Public Roadways

Project Name: Project Number: Job / Task Name: JHA No.: 32

Task Step	Hazard	Control Measures
Performing work near vehicle traffic.	Worker struck by a moving vehicle in parking lot or along a roadway because of decreased visibility of worker.	Any worker in the right of way on a federally funded highway exposed to equipment or traffic must wear high visibility safety apparel, including reflectivity that conforms to ANSI 107-2004 Performance Class I, II or III Voluntary Standards.
		Class I - <25 mph (Standard Traffic Safety Vest)
		Class II - >25 mph, Class III - >50 mph <50mph
	Pedestrian or cyclist injured by obstacles on worksite and/or by insufficient signage.	Keep worksite neat and clean and provide a dedicated pedestrian/cyclist path for safe navigation in-between vehicle traffic and worksite. Ensure that protective measures (including physical barriers and signage) are sufficient to prevent unauthorized entry when the worksite is unattended.
RM North America	2	Form Rev.: 05-0



North America Job Hazard Analysis Work On or Near Public Roadways

Project Name: Project Number: Job / Task Name: JHA No.: 32		

Personal Protective Equipment Required for this Task:

Type		Description	
Traffic Safety Vest	Type I, II or III safety vest as noted above		

Forms Required for this Task:

Type	Description
Permit	Permits may be required by a local official in the jurisdiction, town or city where the work is to be
	performed.
Traffic Management Plan	Details the type of roadway present near or on which the work will be performed, type of protective
	barriers to be used, signage and personal protective equipment to be used.

Training Required for this Task:

Training recounted for this Tusk	
Type	Description
None	None

Name	Date		
·			



North America Job Hazard Analysis Personal Protective Equipment

Project Name:
Project Number:
Job / Task Name:
JHA No.: 13

	Document Routing	
FSO	Retain copy in site health & safety file, amend to HASP as necessary.	
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.	

This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork.
site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA
 should be reviewed regularly with site personnel who will be performing this task.

Task Description:

Guidelines for selection and use of personal protective equipment (PPE). PPE is only to be used after engineering and administrative controls have been considered and found to be non-feasible. Guidance for respiratory protection and fall protection is included in separate JHAs

Hazard Analysis:

Task Step	Hazard	Control Measures
General fieldwork	A head injury could occur from a falling or flying object, or a head injury could be sustained from bumping into something.	A hard hat meeting the American National Standards Institute (ANSI) Z-89.1 standard must be worn. These hardhats contain an inner suspension system that should be checked regulatory to ensure straps are not worn and that space exists between the shell of the hardhat and the suspension straps.
	Wearing a "typical" hardhat around electrical equipment may result in electrical shock.	Electrical shock protection hardhats - Class A for low voltage (up to 2,200 volts), Class B for high voltage (up to 20,000 volts), and Class C for no electrical shock protection.
General fieldwork	A foot injury could occur from a falling or rolling object, or an object may pierce the sole of the shoe.	Steel toe protective footwear should be worn that meets or exceeds the American Society for Testing and Measurement (ASTM) F2413-05 standard.
	Electrical shock may occur with steel-toe boots.	Footwear worn around electrical circuits should also be non- conductive.



North America Job Hazard Analysis **Personal Protective Equipment**

Project Name: Project Number: Job / Task Name: JHA No.: 13

Task Step	Hazard	Control Measures		
Cutting by hand	Hand injury could occur from handling an object with sharp edges of a fixed open-blade knife.	Fixed open-blade knives (such as pocket knives) may not be used on ERM jobsites, with few exceptions. If their use is required, cut-resistant gloves (such as Kevlar) must be worn and the PM or FSO must be informed prior to their use.		
		Employees performing significant amounts of cutting tool use should wear high-visibility gloves to encourage awareness of where hands are being placed.		
Handling chemicals by hand	Dermal exposure to hands from chemicals during soil and/or groundwater sampling.	Wear nitrile or latex protective gloves when handling sample media. Double-layering these gloves is a good idea for added protection. If acidic or caustic chemicals are present, wear outer neoprene or rubber gloves.		
O&M or Subsurface Injection	Dermal exposure to body from chemicals during operations and maintenance activities or subsurface liquid injection activities.	When working with commercial, full-strength chemicals ensure splash protection is worn (such as a polyethylene coated suit) and that gloves and boots are taped to the suit to prevent liquid splash.		
General fieldwork	Foreign object or liquid splash to the eye.	Safety glasses conforming to the ANSI Z-87 standard must be worn for field activities. Safety glasses are appropriate for use when general eye protection is needed.		
Work around liquid splash and/or flying particle hazards		For liquid splash hazards or hazards from flying particles, tight-fitting safety goggles should be worn. A faceshield should be considered for use when splash hazards from commercial, full-strength chemicals.		
Work around active roadways	Struck by moving vehicles when working outside or along a roadway.	High-visibility safety vests should be worn when working in parking lots or by active roadways. Class I may be used when traffic is below 25 mph, Class II for 25-50 mph, and Class 3 for >50 mph.		



Form Rev.: 05-08



North America Job Hazard Analysis Personal Protective Equipment

Project Name:				
Project Number:		•		
Job / Task Name:			•	
JHA No.: 13				· ,

Task Step	Hazard	Control Measures
Work in high noise	Hearing damage from noise exposure greater than	Attempt to perform work when elevated noise is not an issue.
environments	85 decibels.	If work must be performed during high noise, wear hearing
i		protection in the form of earplugs or earmuffs. Further details
		are given in the "Work in High Noise Environments" JHA.
O&M or	Electrical shock	Lockout/tagout/tryout should be performed by licensed
Lockout/Tagout/Tryout		electricians or others that have been specifically authorized by
		ERM to do so. PPE appropriate to this work includes a cotton
		t-shirt, Class II Electrical Arc Protection suit, Class O (low
		voltage) gloves, and non-conductive footwear.

Training Required for this Task:

Type	Description
Personal Protective Equipment	PPE training, normally included in 8-hour refresher training, provides guidance on the selection,
	inspection, use, maintenance, and decontamination of different types of PPE

Forms Associated with this Task:

	·	
Type	Description	
None		

Name	Date
1	
	·



North America Job Hazard Analysis Work in Hot Environments

Project Name:			
Project Number:			
Job / Task Name:			
JHA No.: 14			
	Document Routin	g	
FSO	Retain copy in site health & safety file, amend to HASP as necessary.		
Project Manager	Retain copy in the office health & safety file, amend to I		
Instructions:	This JHA has been developed and approved by	the North America Safety Team. Prior to conducting fieldwork.	
	site-specific hazards related to this task must be	incorporated by the project team. Once completed, the JHA	
	should be reviewed regularly with site personne	el who will be performing this task.	
Task Description:			
	eas where heat stress may occur.		
	Committee and the committ		
Hazard Analysis:			
Task Step	Hazard	Control Measures	
			
· · · · · · · · · · · · · · · · · · ·			
Personal Protective Equipme	ent Required for this Task:		
Type		Description	
Training Required for this T	ask:		
		Description	
Туре		Description	
None			
Forms Associated with this	Гask:	·	
Type		Description	
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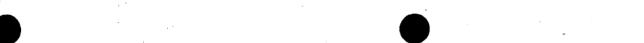


North America Job Hazard Analysis Work in Hot Environments

Project Name:		 		
Project Number:	•			
Job / Task Name:		•		
JHA No.: 14				
		 	· .	

				 <u>'</u>	· ·	
None					-	
Tione	<u> </u>	· · · · · · · · · · · · · · · · · · ·	 			

Name	Date







Project Name:
Project Number:
Job / Task Name:
THA No.: 17

	Document Routing		
FSO	Retain copy in site health & safety file, amend to HASP as necessary.		
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.		· .
· · ·		· · · · · · · · · · · · · · · · · · ·	

1	This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork.
	site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA
	 should be reviewed regularly with site personnel who will be performing this task.

Task Description:

Guidelines for selection, use, and maintenance of respiratory protection.

Hazard Analysis:

Task Step	Hazard	Control Measures
Offsite Preparation	Employee chemical exposure could occur or unqualified personnel could be put at risk if not specified early in the planning process.	The health and safety plan must specify the need for respirators, including the requirement that employees working on the project must be medically cleared to wear a respirator and have a current respirator fit-test on the type and model respirator they will be expected to wear. If organic vapor cartridges are to be used, develop a cartridge change schedule.
		Include the following exposure limits for each contaminant if they are available. The lowest exposure limit of these should be used as the trigger to don respiratory protection:
		 OSHA Permissible Exposure Limit (PEL) NIOSH Recommended Exposure Limit (REL) ACGIH Threshold Limit Value (TLV) Immediately Dangerous to Life or Health (IDLH)
· ·		Additionally, respirator cartridge types must be specified in the health and safety plan and available on-site.



Project Name:
Project Number:
Job / Task Name:
IHA No.: 17

Task Step	Hazard	Control Measures
Prior to Using Respirator	Respirators that are not cleaned, inspected, or maintained well will not provide protection as	Prior to donning a cartridge-type respirator, inspect to ensure it is in good condition, including straps, rubber sealing surfaces, and non-visible parts such as inhalation and
	designed.	exhalation valves. Do not use respirators with cracked rubber parts or stretched straps unless repaired. Clean if necessary using an alcohol wipe or mild soap and water solution.
		Cartridge-type respirators may not be used if chemical exposures exceed 10 times the OSHA PEL or are at IDLH levels.
		Inspect supplied air (SCBA at least monthly, and prior to each use. Inspections of SCBAs and other emergency-type respirators must be documented.
Don the Respirator	Incorrect seal on the respirator could cause employee chemical exposures.	Prior to donning respirators, personnel must be clean-shaven in areas of the face where the respirator seal touches, including any inner nose cups.
		For cartridge-type respirators, place the cartridges on the respirator facepiece. Cartridges should not be torqued to tighten (only slightly tightened).
		The respirator must be donned prior to other personal protective equipment in the head/neck area so that nothing comes between the respirator straps and the head surface.
		Safety glasses, hard hats, etc. must be donned after the respirator. Because of this, ERM prefers employees wear full-face respirators when possible.
		For cartridge-type respirators, perform a positive and negative fit-check to make sure the seal of the respirator is good.



Form Rev.: 05-08



Project Name:
Project Number:
Job / Task Name:
THA No. 17

Task Step	Hazard	Control Measures
Performing Work Wearing	Tendency to readjust respirator facepieces when	Excessive sweating may cause the respirator facepiece to slide
Respirators	sweating is high, and can result in chemical	on the wearer's face resulting in a compromised respirator
	exposures.	seal. If this occurs, stop work and move to an area with no
•		chemical contamination (go through the decontamination line
		if present), readjust the respirator, and perform positive and
		negative fit-checks to ensure a proper face seal.
	Particulate cartridge clogging may occur, or	If using particulate cartridges (N, R, or P-types), and it
	chemicals may break through chemical cartridges.	becomes difficult to breathe, move to a clean area and change
	·	cartridges.
		If using chemical cartridges other than organic vapor-types,
		change cartridges if any amount of chemical odor breaks
		through the respirator cartridge. For organic vapor cartridges,
		change respirator cartridges according to the cartridge change
Doffing Respirators	Charia	schedule in the health and safety plan.
Doning Respirators	Chemical exposure could occur if respirators are	If a decontamination line is present, proceed through the line
	taken off incorrectly.	as directed. If no decontamination line is being used, all other
	·	personal protective equipment except gloves should be
		removed before taking the respirator off. Once removed,
		respirator cartridges should be discarded and facepieces
		cleaned.
		If sharing respirators, the respirator must be cleaned and
•	·	sanitized before use by another employee.

Personal Protective Equipment Required for this Task:

Type	Description	
None		



Project Name:			
Project Number:			
Job / Task Name:			
JHA No.: 17	· · · · · · · · · · · · · · · · · · ·	 · · · · · · · · · · · · · · · · · · ·	

Training Required for this Task:

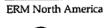
Type Respirator Training	Description Annually-required training necessary for employees to wear positive or negative-pressure respirators.
Respirator Fit-Test	An annually-required test of the fit of a certain model and type respirator to an employee's face. All negative-pressure (filter or cartridge-type) and supplied-air facepieces must be fit-tests. Employees must be fit-tested on each model and type of respirator to be worn.

Forms Associated with this Task:

Torrits Associated With this Tust	
Type	Description
SCBA Inspection Checklist	Checklist documenting monthly inspection of self-contained breathing apparatus units (SCBA).

Name	Date







North America Job Hazard Analysis Heavy Equipment Operations

Project Name:
Project Number:
Job / Task Name:
IHA No · 19

	Document Routing		
FSO	Retain copy in site health & safety file, amend to HASP as necessary.		
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.	and the second second	

Inst	ructions:	This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork.
	•	site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA
		should be reviewed regularly with site personnel who will be performing this task.

Task Description:

Guidelines for working around heavy equipment.

Hazard Analysis:

Task Step	Hazard	Control Measures
Offsite Preparation	Untrained workers operating heavy equipment pose potential life-threatening hazards to employees.	ERM policy and practice is that our employees do not operate heavy equipment except in unusual circumstances. If ERM personnel are to operate heavy equipment, this must be stated in the health and safety plan for the project. Only employees with training and/or demonstrated experience operating heavy equipment may do so.
		Subcontractor personnel operating heavy equipment must be trained and/or have demonstrated experience operating such equipment. ERM must be in possession of evidence of training and/or experience prior to Subcontractor personnel operating such equipment.
		All heavy equipment must meet applicable design standards (ANSI, etc.). A copy of the operating manual must be carried on all heavy equipment, including a load-rating chart and any special operating considerations.



North America Job Hazard Analysis Heavy Equipment Operations

Project Name: Project Number: Job / Task Name: JHA No.: 19

Task Step	Hazard	Control Measures	
Heavy Equipment Operation	Injury to operator and those in immediate vicinity.	Before starting operations, operators must ensure no one is working on or near machinery. If equipment is to be operational in close proximity to other workers, a spotter must be working in tandem with the operator. All heavy equipment must be inspected daily to ensure good working order. Critical safety items, such as brakes, backup alarms, horns, etc. must be in working order. Machinery will critical safety items in disrepair may not be used until they a fixed.	
		Operators must operate equipment while wearing seatbelts, if provided, and at reasonable speeds. Mounting/dismounting a moving machine is prohibited. Do not transport personnel or equipment in machinery not designed for this purpose.	
		Overhead obstructions must be assessed before operating machinery. If equipment is to be operated in close proximity to overhead obstructions, a spotter must be working in tandem with the operator. Safe working distances must be specified in the health and safety plan or JHA supplied by the subcontractor.	
Ending Heavy Equipment Operations	Leaving equipment in a non-neutral position poses contact hazards.	All heavy equipment must be placed in a neutral position when not in operation. Dump truck beds must be lowered, buckets must be at ground level, forklift tines must be at ground level, etc. Keys must be removed from all heavy equipment when not in use4.	





North America Job Hazard Analysis Heavy Equipment Operations

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Project Name:				
Project Number:				
Job / Task Name:			•	
JHA No.: 19	· · · · · · · · · · · · · · · · · · ·			
Personal Protective Equipment	Required for this Task:			
Type		Description		
High-visibility safety vest	Vest worn by equipment operators ar	nd those working in the area impact	ed by moving machinery	
Training Required for this Tas	Les			
	K.			
Type		Description		
Heavy Equipment Operation	Operators must be trained and/or have demonstrated experience for each type of heavy equipment they will operate.			
Forms Associated with this Tas	sk:			
Type		Description		
Heavy Equipment Inspection	Form for documenting daily heavy ed	-		
form	,,,,,,	Imb		
		Site-Specific Job Hazard Analysi	s Completed by:	
		Name	Date	



North America Job Hazard Analysis Portable Hand and Power Tools

Project Name:
Project Number:
Job / Task Name:
IHA No.: 20

	Document Routing	:
FSO	Retain copy in site health & safety file, amend to HASP as necessary.	
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.	

Instructions:	This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork.
	site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA
	should be reviewed regularly with site personnel who will be performing this task.

Task Description:

Guidelines for working with portable hand and power tools.

Hazard Analysis:

Task Step	Hazard	Control Measures	
Gather tools to take to jobsite	An improper tool available at jobsites encourages unsafe behaviors and could lead to injury.	Ensure tools taken to jobsites are kept in optimal condition (sharp, clean, oiled, etc.) to ensure efficient operation. Tools must only be used for their intended purposes - tools should not be used as pry-bars. Ensure power cords attached to powered-equipment are not damaged.	
		Any damaged tool or electrical cord must be tagged and taken out of service.	
Using cutting tools Major and/or minor cuts to personnel		Fixed open-blade knives (such as pocket knives) may not lused on ERM jobsites, with few exceptions. If their use is required, cut-resistant gloves must be worn while using the and the PM or FSO must be informed prior to their use.	
		Employees performing significant amounts of cutting tool use should must high-visibility gloves to encourage awareness of where hands are being placed.	



North America Job Hazard Analysis Portable Hand and Power Tools

Project Name: Project Number: Job / Task Name: JHA No.: 20

Task Step	Hazard	Control Measures
Using screwdrivers	Puncture injuries	Do not hold objects in the palm of your hand and press a screwdriver into it – these objects should be placed on a flat surface.
		Do not use screwdrivers as hammers, or use screwdrivers with broken handles. Use insulated screwdrivers for work on electrical equipment.
Using hammers	Creation of sparks	Use brass hammers in areas where creating sparks would pose ignition hazards.
	Particles may lodge in employee's eyes	Always use safety glasses when striking any object with a hammer. If hammer-head shows signs of mushrooming, replace it immediately.
	Loose handles may create a projectile hazard	Replace any hammer with a loose handle so the hammer-head does not detach and cause injuries.

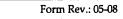
Personal Protective Equipment Required for this Task:

Type	Description
High-visibility glove	Gloves typically in fluorescent green, orange, or yellow.
Cut-resistant glove	Limited protection is afforded by leather gloves from cuts. Kevlar gloves provide more protection when significant cut/puncture hazards exist.

Training Required for this Task:

Training required for this rusk.	
Type	Description
None	







North America Job Hazard Analysis Portable Hand and Power Tools

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Project Name:			1	
Project Number:		· ·		
Job / Task Name:	•			
JHA No.: 20	·		·	· · ·
Forms Associated with th	is Task:			
Type			Description	
None		·	- -	

Name	Date	
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North America Job Hazard Analysis Hazardous Waste Operations and Emergency Response

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Project Name:		
Project Number:		
Job / Task Name:		
JHA No.: 27	•	
	Document Routing	
FSO	Retain copy in site health & safety file, amend to HASP as n	necessary.
Project Manager	Retain copy in the office health & safety file, amend to HAS	
Instructions:	This IHA has been developed and approved by the	North America Safety Team. Prior to conducting fieldwork.
mstructions.	site specific beyonds related to this test must be in-	amounted by the arrivations of the conducting fieldwork.
	she-specific nazards related to this task must be inco	orporated by the project team. Once completed, the JHA
	should be reviewed regularly with site personnel w	no will be performing this task.
Task Description:		
Guidelines for working on job	bsites requiring compliance with the OSHA Hazar	dous Waste Operations and Emergency Response
(HAZWOPER) standard.		6,
()		
Hazard Analysis:		
Task Step	Hazard	Control Measures
•		Committee
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Personal Protective Equipme	ent Required for this Task:	
Туре	The first time tube.	Description
Туре		Description
Training Required for this T	ask:	
Туре		Description
• •		Description
None		
Forms Associated with this	Γask:	
	- · · · · · · · · · · · · · · · · · ·	



North America Job Hazard Analysis Hazardous Waste Operations and Emergency Response

Project Number: Job / Task Name: JHA No.: 27	Project Name:	•			
JHA No.: 27	Project Number:		•		
JHA No.: 27	Job / Task Name:			-	
			<u> </u>		•

	Type						Description	
None	٠		·	٠	•	•		

Name	Date
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North America Job Hazard Analysis Hot Work

D I (N	 		
Project Name:			
Project Number:		•	
Job / Task Name:			•
JHA No.: 28			,
	Document Ro	uting	
FSO	Retain copy in site health & safety file, amend to HA	ASP as necessary	
Project Manager	Retain copy in the office health & safety file, amend		
1 Toject Withinger	Realit copy in the office health & safety file, afficile	to TIASI as necessary.	
Instructions:	This JHA has been developed and approved	by the North America Safety Te	eam. Prior to conducting fieldwork.
	site-specific hazards related to this task must	be incorporated by the project	team. Once completed, the JHA
	should be reviewed regularly with site perso	nnel who will be performing th	nis task.
Task Description:		•	
	obsites where ERM subcontractors are perfor	ming welding cutting or bra	zing operations
Garagines for Working of	sesties where Entire subcontractors are perior	nuit welding, cutting, or bra	zing operations.
Hazard Analysis:			
Task Step	Hazard		1 M
1 ask Step	пахаги		ontrol Measures
			<u> </u>
	<u> </u>		
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		•	
Personal Protective Fouring	nent Required for this Task:	•	•
	Tent Required for this Task.		
Type		Description	•
Training Required for this	Task:		
Type		Description	
, , , , , , , , , , , , , , , , , , , ,	·	Description	
None			
		1	
Forms Associated with this	Tack		
	I ASK.		
Туре	<u> </u>	Description	
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North America Job Hazard Analysis Hot Work

Project Name:				:
Project Name: Project Number:			,	
Job / Task Name: JHA No.: 28			•	
JHA No.: 28	•		 	
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None			

Name	Date
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North America Job Hazard Analysis Work On or Near Water

	• • •	
Project Name:		
Project Number:		
Job / Task Name:	•	
JHA No.: 31		
FSO	Document Ro	
1	Retain copy in site health & safety file, amend to H	
Project Manager	Retain copy in the office health & safety file, amend	d to HASP as necessary.
Instructions:	This IIIA has been developed and account	The state of the s
instructions:	inis jriA has been developed and approved	by the North America Safety Team. Prior to conducting fieldwork.
	site-specific nazards related to this task mus	st be incorporated by the project team. Once completed, the JHA
	should be reviewed regularly with site person	onnel who will be performing this task.
Tala Danada da		
Task Description:		
Guidelines for working on o	or in the vicinity of any body of water.	
Hazard Analysis:		
Task Step	Hazard	Control Measures
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	·	
Personal Protective Equipm	nent Required for this Task:	
Type		Description
, , , ,		
Training Required for this	Task:	
Type		Description
None		Description
Tione		
Forms Associated with this	Task	
	Task:	
Type		Description
FRM North America	. 7	Form Part 05 05



North America Job Hazard Analysis Work On or Near Water

Project Name:					
Project Number:	41.1				
Job / Task Name:					
JHA No.: 31	•				
None					
				Site-Specific Job Hazard Analy	sis Completed by:
				1	
			•	Name	Date
		,			



ERM North America

2 Form Rev.: 05-08

Applicable Safe Work Practices (SWPs)

Appendix C

12 November 2010
Project No. 0042525
North Penn Area 2 Superfund Site
Hatfield Township, Pennsylvania



STANDARD OPERATING PROCEDURE				
SOP #:	1			
Title:	Hazard Communication (HazCom)			
Last Rev.:	12/31/07			
Page:	1 of 2			

SCOPE

This procedure provides guidance on meeting regulatory requirements and ensuring that the information necessary for the safe use, handling and storage of hazardous chemicals is provided and made available to employees.

DEFINITIONS

- Hazardous Chemical Any chemical which is a physical hazard or a health hazard.
- Hazard Warning Any words, pictures, symbols, or combination thereof appearing on a label or other appropriate form of warning which convey the specific physical and health hazard(s), including target organ effects, of the chemical(s) in the container(s).
- Health Hazard A chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals that are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents that act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes.
- **Physical Hazard** A chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

PROCEDURE

- A. RCM Health and Safety Coordinator will develop a chemical inventory of all known chemicals to be used or present as a potential contaminant at the job site.
- B. RCM Health & Safety Coordinator will ensure that all containers (drums, bottles, etc.) are labeled with the identity of the known hazardous chemical contained and any appropriate hazard warnings. Containers that are not labeled or where labels have faded or been removed will be relabeled immediately.
- C. RCM Health & Safety Coordinator will include NIOSH Universal Chemical Safety Data Cards for chemicals present as site constituents of concern and Material Safety Data Sheets (MSDSs) for chemicals brought to the site for the job. For assistance, contact the RCM Health and Safety Coordinator.
- D. The Site Safety Officer will ensure employees have been trained on site-specific HazCom, including:



S	STANDARD OPERATING PROCEDURE				
SOP #:	1				
Title:	Hazard Communication (HazCom)				
Last Rev.:	12/31/07				
Page:	2 of 2				

- 1. Methods that may be used to detect a release of hazardous chemical(s) in the workplace;
- 2. Physical and health hazards associated with chemicals;
- 3. Protective measures to be taken;
- 4. Safe work practices, emergency responses and use of personal protective equipment (PPE); and
- 5. Information on the Hazard Communication Standard including:
 - a. Labeling and warning systems, and
 - b. An explanation of Material Safety Data Sheets.
- E. RCM Health & Safety Coordinator will identify PPE based on the task involved and the chemical properties.
- F. The Site Safety Officer will inform employees of any non-routine tasks and the chemical hazards associated with the tasks. Review the safe work practices and use of required PPE prior to the start of such tasks.
- G. The Site Safety Officer will provide information on hazardous chemicals known to be present to subcontractors and other employers on the site. Employers are responsible for providing necessary information to their employees. Ensure other onsite employers are provided with the applicable HazCom information.
- H. All site personnel are required to report any incident of a chemical over-exposure or of a chemical spill to the Site Safety Officer. Follow the emergency response/spill response procedures described in the HASP.

<u>REFERENCES</u>

Regulatory References

• 29 CFR 1910.1200, Hazard Communication

Technical References

NIOSH Universal Chemical Safety Data Cards

Procedural References

- SOP 9, Personal Protective Equipment
- RCM Health and Safety Program, Appendix B, Section 3

REVISION LOG

DATE	REV. #	APV'D		COMMENTS	,
12/31/07	0	ELG	Issued for use		-



STANDARD OPERATING PROCEDURE					
SOP #:	3				
Title:	Medical Services / First Aid				
Last Rev.:	12/31/07				
Page:	1 of 2				

SCOPE

This procedure describes the requirements for providing medical services and first aid at the job site.

DEFINITIONS

None.

PROCEDURE

- A. RCM Health & Safety Coordinator will identify the mode by which medical services and first aid will be administered and document in the Health and Safety Plan (HASP). This will generally be recorded by identifying the nearest medical facility to the job site and providing a map with the location identified.
- B. In the absence of reasonably accessible medical services (i.e., within 5 minutes by ambulance), the Site Safety Officer or a person certified in first aid will be available at the site to render first aid.
- C. At jobsites where the eyes or body of any employee may be exposed to corrosive or otherwise hazardous chemicals, quick-drenching/eye washing facilities must be provided.
- D. First aid supplies must be easily accessible at a job site, when required. The contents of the kit must be checked by the Site Safety Officer before being sent out on each job and weekly during the job, to ensure that items used are replaced.
- E. Field first aid kits should contain the following items:

Band aids 3/4" x 3"
Non-stick pads, medium
Kling rolled bandage 2"
Triangular bandage 51"
Hypo-allergenic first aid cream
Adhesive Tape ½" x 5 yd
Scissors
Butterfly bandages

Antiseptic wipes
Burn cream, 8 oz.
Foil packs
Amoply, ammonia inhalants 0.33 ml.
Tylenol, extra strength
Oval eye pads
Examination gloves

REFERENCES

Regulatory References

29 CFR 1926.50, Medical Services and First Aid



STANDARD OPERATING PROCEDURE					
SOP #:	3				
Title:	Medical Services / First Aid				
Last Rev.:	12/31/07				
Page:	2 of 2				

Technical References

• ANSI Z308.1-1978, Minimum Requirements for Industrial Unit-Type First-aid Kits

Procedural References

• RCM Health & Safety Program, Appendix B, Section 2

DATE	ATE REV. # APV'D COMMENTS		COMMENTS
12/31/07	0	ELG	Issued for use



STANDARD OPERATING PROCEDURE					
SOP #:	5				
Title:	Heat Stress				
Last Rev.:	12/31/07				
Page:	ge: 1 of 4				

SCOPE

This procedure provides work practices to minimize the impact of heat stress caused by exposure to hot environments or working conditions.

DEFINITIONS

- Acclimatization The ability to adjust to hot working conditions. This adjustment to
 heat, under normal circumstances, usually takes about 5 to 7 days, during which time
 the body will undergo a series of changes that will make continued exposure to heat
 more endurable.
- **Heat Index** An accurate measure of how hot it really feels when relative humidity (RH) is added to the actual air temperature.

PROCEDURE

- A. The Site Safety Officer will implement techniques for preventing heat stress-related health issues. Prevention techniques include:
 - 1. Provide shaded areas with cross-ventilation, if possible, for lunch and breaks.
 - 2. Schedule physically demanding and strenuous tasks, or tasks requiring full-body chemical protection, for early in the day, if possible.
 - 3. Drink at least 6-8 ounces of cool water every 60 minutes.
 - 4. Use the buddy system and look for signs of heat stress. Any employee with signs of heat stress must immediately proceed to the break area. Signs and symptoms for various heat stress disorders and recommended first aid are listed in the following table.



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Disorder	Symptoms	Cause	Prevention/First Aid
Heat Rash	♦ Rash	♦ Hot, humid conditions	♦ Ointments
or Prickly	♦ Itching	♦ Sweat doesn't	• Keep skin clean and dry
Heat		evaporate easily	♦ Good daily personal hygiene
		♦ Sweat ducts become	
•		clogged	
Heat	◆ Sudden onset of muscle	◆ Loss of water	♦ Move into shade
Cramps	cramps usually in legs or	(sweating)	♦ Loosen clothing
	arms	◆ Loss of electrolytes	Drink tepid electrolyte drinks
	♦ Hot, moist skin	♦ Replacing water but	or water
	◆ Normal pulse	not electrolytes	◆ Seek medical assistance if
	♦ Normal or slightly elevated		conditions persist
	temperature	<u> </u>	<u> </u>
Heat	♦ Pale, clammy skin	◆ Overexertion	♦ Move into shade
Exhaustion	◆ Profuse perspiration	◆ Excessive loss of water	◆ Remove PPE
	◆ Thirst from dehydration	and electrolytes	♦ Loosen street clothing
	♦ Weakness	· ·	◆ Cool by applying damp cool
	◆ Headache	·	compresses or ice packs
	♦ Nausea		◆ Drink tepid electrolyte drinks
•	◆ Loss of coordination		or water
			◆ Summon medical assistance
Heat Stroke	◆ Elevated temperature	◆ Failure of body's	◆ Summon medical assistance
	(>103F)	cooling (sweating)	◆ Move to shade
	♦ Flushed, hot, dry skin	mechanism	◆ Remove PPE
	◆ Absence of sweating		◆ Loosen street clothing
	♦ Delirious		◆ Cool by fanning or applying
	♦ Rapid pulse		damp compress or ice packs
	♦ Nausea		
	◆ Headache		
	♦ Dizziness		
	 ◆ Unconsciousness 		

5. The Site Safety Officer must verify that a work-rest cycle based on the heat index is implemented for site workers as applicable. Refer to the following three tables. To use the chart, read the temperature at the left and humidity across the top, the heat index is where the two intersect. For example, with a temperature of 96 and a humidity of 50%, the Heat Index is 108. Determine what the associated risk level is, based on the heat index. Use the risk level and heat index to determine the appropriate work-rest cycle.



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Heat Index Chart

Rela	Relative Humidity (%)													
		40	45	50	55	60	65	70	75	80	85	90	95	100
	110	136												
	108	130	137											
	106	124	130	137								1		
	104	119	124	131	137									
	102	114	119	124	130	137								
	100	109	114	118	124	129	136						,	
	98	105	109	113	117	123	128	134						
	96	101	104	-108-	-112	116-	-121	126	-132					
	94	97	100	102	106	110	114	119	124	129	136			
	92	94	96	99	101	105	108	112	116	121	126	131		[
(F)	90	91	93	95	97	100	103	106	109	113	117	122	127	132
	88	88	89	91	93	95	98	100	103	106	110	113	117	121
Temperature	86	85	87	88	89	91	93	95	97	100	102	106	108	112
era	84	83	84	85	86	88	89	90	92	94	96	98	100	103
mp	82	81	82	83	84	84	85	86	88	89	90	91	93	95
Te	80	80	80	81	81	82	82	83	84	84	85	86	86	87

Heat Index Risk Level and Associated Health Effects

Heat Index	Associated Risk
>130	Extreme Danger
	Heat stroke highly likely with continued exposure
105-130	Danger
	Heat exhaustion and heat cramps likely and heat stroke
	possible with prolonged exposure and/or physical activity
90-105	Extreme Caution
	Heat cramps and heat exhaustion possible with prolonged
	exposure and/or physical activity
80-90	Caution
	Fatigue possible with prolonged exposure and/or physical
	activity

NOTES:

- Heat Index values were devised for shady, light wind conditions. Exposure to full sun may increase these values by up to 15°.
- Heat Index values were devised for the general public wearing typical lightweight summer clothing. Acclimatized workers may be able to work under conditions with a slightly higher Heat Index.
- The use of personal protective equipment, including clothing increases the heat stress load on the body.



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The work-rest cycle outlined below should be implemented based on the professional judgment of the Site Safety Officer and/or the Project Health and Safety Consultant. Workers must drink 8 ounces of cool water at each break.

Heat Index	Risk Level	Work-Rest Cycle
> 130	Extreme Danger	15 minute break every 30 minutes
105-130	Danger	15 minute break every 60 minutes
90-105	Extreme Caution	15 minute break every 90 minutes
80-90	Caution	15 minute break every 120 minutes

- B. The Site Safety Officer and the Construction Manager will observe workers to verify compliance with and effectiveness of prevention techniques.
- C. The Site Safety Officer should provide first aid treatment for heat stress related health issues.
- D. In the event a heat stress related incident occurs, the Site Safety Officer will report the incident following guidelines in the HASP.

REFERENCES

Regulatory References

None

Technical References

NOAA - National Weather Service, Heat Index, Measure of How Hot it Feels

Procedural References

None

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SCOPE

This procedure provides work practices to minimize the impact of cold stress caused by exposure to cold environments or working conditions.

DEFINITIONS

- Frostbite Occurs when the extremities do not get sufficient heat from the central body stores. The fluids around the cells of the body tissues freeze from exposure to low temperatures. This condition can result in damage to, and loss of, tissue. The most vulnerable areas are the nose, cheeks, ears, fingers, and toes.
- Hypothermia This is the most severe form of cold stress and results from a drop in the body's core temperature. Hypothermia can occur in relatively mild temperatures if there is a wind and the person's clothing becomes wet. The signs or symptoms of hypothermia are:
 - First, uncontrollable shivering and the sensation of the cold;
 - Heartbeat slows and may become irregular;
 - Pulse weakens and blood pressure changes;
 - As the body's core temperature drops, other signs may include cool skin, slow irregular breathing, and apparent exhaustion;
 - When core temperatures are in the mid-range, the victim may become listless, confused, exhibit severe shivering, or develop severe pain in the extremities; and
 - Final signs are a significant drop in blood pressure, fatigue, and shallow respiration.

PROCEDURE

- A. The Site Safety Officer will implement techniques for preventing cold stress-related health issues. Prevention techniques include:
 - 1. Require the use of additional protective clothing.
 - 2. Allow workers to change clothes that have become wet.
 - 3. Provide thermal insulating materials on metal handles of tools and equipment.
 - 4. In snowy or icy conditions, require the use of UV eye protection, as well as from blowing crystals.
 - 5. Provide a warm and sheltered area for changing clothes and taking breaks.
 - 6. Provide hot liquids, such as soups, warm drinks, etc. in the break area.



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- 7. Use the buddy system and look for signs of cold stress. Any employee observed with signs of cold stress shall immediately proceed to the break area.
- B. The Site Safety Officer and the Construction Manager will observe to verify compliance with and effectiveness of prevention techniques.
- C. The Site Safety Officer will provide first aid treatment for cold stress related health issues include moving to warm area. Seek medical attention if signs or symptoms of hypothermia or frostbite are present.

REFERENCES

Regulatory References

None.

Technical References

None.

Procedural References

None.

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SCOPE

This procedure provides guidance for determining appropriate means for handling natural hazards that may be encountered while conducting fieldwork.

DEFINITIONS

None.

PROCEDURE

Potential exposure natural hazards during performance of this project is believed to be minimal. However since the work is performed outside some precautions should be taken to guard against the following hazards. Keep in mind that the hazards may vary depending on the time of year or geographical region. Infrequent hard freezes may allow insects and snakes to be active all year round in some parts of the United States. Refer to Attachments 1 through 3 for photos and more thorough descriptions of the more common natural hazards, which might be encountered.

- A. Identify type of natural hazard present.
- B. When a natural hazard (such as poisonous plants, feral animals, insects and snakes) is encountered, back away and evaluate the situation.
- C. Develop a plan which may include any of the following:
 - 1. Remove the natural hazard if it can be done safely.
 - 2. Avoid the natural hazard if it cannot be removed. Additionally, use appropriate PPE or outer clothing for protection from the hazard. Refer to SOP 8, Personal Protective Equipment.
 - 3. Get assistance in removing or working around the natural hazard. In some instances, this may require professional help from animal control or an insect expert.
- D. In the event there is contact with the natural hazard, if it appears to be a life threatening situation, such as anaphylactic shock or a snake bite, seek medical attention immediately.



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A. <u>POISONOUS PLANTS</u>

- 1. Poison ivy is in the form of a vine, while oak and sumac are bush-like.
- 2. All produce a delayed allergic hypersensitivity.
- 3. The plant tissues have an oleoresin, which is active in live, dead, and dried parts and may be carried through dust, contaminated articles, and the hair of animals.
- 4. Symptoms usually occur 24 to 48 hours after exposure resulting in burning or stinging, and weeping and/or crusted blisters.
- 5. The best antidote for poisonous plants is recognition and avoidance.
- 6. Should exposure to any of these plants occur, notify the Site Safety Officer and wash the affected area with a mild soap and water, but do not scrub the area.

B. TICKS

- 1. Ticks attach to their host's skin and intravenously feed on its blood creating an opportunity for disease transmission.
- Covering exposed areas of the body and the use of tick repellent are two ways to prevent tick bites.
- 3. Periodically during the workday employees should inspect themselves for the presence of ticks.
- 4. Notify the Site Safety Officer of any tick bites as soon as possible, medical attention may be required.

C. SPIDERS

1. Black Widow

- a. The black widow is a common venomous spider found in vacant rodent burrows, under stones, logs and long grass, and in hollow stumps and brush piles.
- b. If disturbed, they typically will retreat to a corner of their web but can be induced to bite only if pressed against the skin.
- c. Notify the Site Safety Officer if bitten, because neurotoxins are injected, it is important to seek immediate medical attention.

2. Brown Recluse

a. The brown recluse or Fiddle Back Spider is another common venomous spider.



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- b. It hides in dark niches and corners, where it may spin a poorly organized, irregular web.
- c. It is shy and will try to run from a threatening situation but will bite if cornered.
- d. Check boots and protective clothing for spiders prior to putting them.
- e. The bite of the brown recluse is usually painless until 3 to 8 hours later when it may become red, swollen, and tender. Notify the Site Safety Officer if bitten.
- f. Prompt medical attention can reduce the extent of ulceration and alleviate other complications that may develop.

D. <u>FIRE ANTS</u>

- 1. One sure sign of the presence of fire ants is their conical mounds, which are a result of the digging of their chambers.
- 2. The sting of a fire ant results in localized reddening of the bite area, accompanied by sharp burning sensations.
- 3. The first ant sting releases a chemical substance that triggers other ants of the colony to sting.
- 4. Anyone seeing fire ant mounds present at the work site should notify the Site Safety Officer, who will then notify the rest of the crew so the mounds may be avoided if possible.

E. <u>CHIGGERS</u>

- 1. Chiggers, also known as "red-bugs" or "harvest mites", are the immature stages of a tiny red mite.
- 2. They inhabit areas of tall grass, associated with low, wet spots, ponds and stream banks, wild berry patches, and forest underbrush.
- 3. The larvae attach themselves to the clothing of people or to the fur of passing animals.
- 4. Wear loose-fitting clothing (if possible) when working outdoors. Apply a repellent containing DEET (N,N-diethyl-meta-toluamide), to shoes, socks, and trousers before entering chigger-infested areas. Caution: some individuals may be sensitive to DEET always read and follow label directions
- 5. Vehicles should be frequently vacuumed to reduce the number of chiggers that may have been deposited.



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6. Flowers of sulfur is another repellant of chiggers. Sulfur may be more benign to use than DEET on some body parts. Avoid breathing dust during application.

F. FLYING INSECTS

- 1. Flying insects such as mosquitoes, wasps, hornets, and bees may be encountered while site activities occur.
- 2. Wear long-sleeved clothes and long pants treated with repellent. Do not treat unexposed skin. Use the repellent according to the manufacturer's recommendations provided on the container.
- 3. Personnel should report flu-like symptoms to the Site Safety Officer, medical attention may be needed.

G. SNAKES

- 1. The most effective way to prevent snakebites is to avoid snakes.
- 2. Personnel should avoid walking in high grass and underbrush.
- 3. Visual inspection of work areas should be performed prior to activities taking place.
- 4. The use of leather boots and long pants will be required, since more than half of all bites are on the lower part of the leg.
- 5. No attempts at killing snakes should be made; many people are bitten in such an attempt.
- 6. If a snake bites someone, Notify the Site Safety Officer and seek medical services.

H. <u>ALLIGATORS</u>

- 1. Never approach an alligator. Always stay at least 30 yards away. Never wade or swim in areas that could contain large alligators.
- 2. Do not dump food or scraps into or near the water. This can attract alligators.
- 3. Always be aware of your surroundings and use caution and common sense.
- 4. If at any time personnel observe alligators at the site they will immediately inform the Site Safety Officer or Construction Manager, who will then notify the rest of the employees and local wildlife personnel.



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I. <u>FERAL ANIMALS</u>

- 1. Feral animals such as rats or other wildlife may be encountered during fieldwork.
- 2. If an animal is diseased, injured or tending a nest, they may become aggressive.
- 3. Notify the Site Safety Officer or Construction Manager if feral animals are at the site, who will then notify the rest of the employees and local wildlife personnel.

ATTACHMENTS

Attachment 1, Poisonous Plants

Attachment 2, Insects

Attachment 3, Snakes

Attachment 4, Other Natural Hazards

REFERENCES

Regulatory References

None

Technical References

None

Procedural References

SOP - 8, Personal Protective Equipment

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Attachment 1

Poisonous Plants

Most species of poison ivy, oak, and sumac have three leaflets; hence, the saying, "Leaves of three, let it be." These plants vary significantly in appearance in different regions of the country, but in most species the flower and fruit structures arise in the angle between the leaf and the twig, the flowers are greenish in spring, and the plant's mature fruit is off-white or pale yellow-green.

Several varieties, including two species each of poison ivy, poison oak, and poison sumac and six subspecies of poison ivy (*Toxicodendron radicans*), are found in the United States. Poison ivy (see figure A below) generally grows east of the Rocky Mountains and poison oak in the West. Both poison ivy and poison sumac are found along the Gulf Coast. Poison oak prefers swampy areas in the Southeast.

Figures A1, A2: Courtesy of Lisa A. Gamer, MD; figure A3: staff photo; figure A4: Janet Robidoux

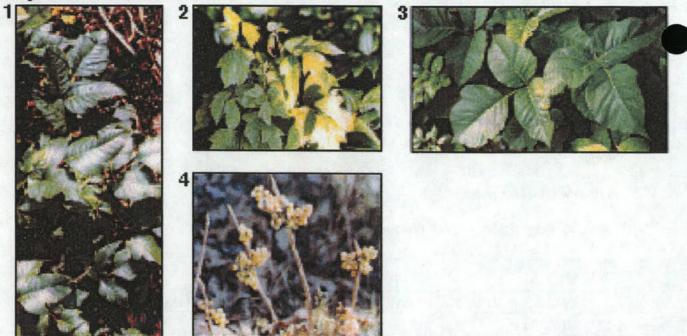


Figure A. Poison ivy (Toxicodendron radicans) can grow as a shrub or vine, but all varieties are characterized by glossy leaves that grow in clusters of three leaflets. The varieties shown here are found in Texas (1,2) and Minnesota (3). The off-white or pale yellow-green berries of poison ivy (4) often remain on the plant through the winter.



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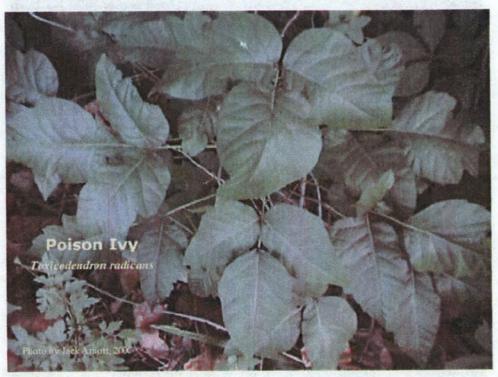
Poison Ivy

A climbing vine with three serrated-edge, pointed leaves grows in the East, Midwest and South. In the northern and western states, poison ivy grows as a non-climbing shrub.

The appearance of these plants is variable. Leaves are alternate and normally consist of three leaflets with the stalk of the central leaflet being longer than those of the other two are but can be found with five or even seven leaflets. The leaflets are two to four inches long, dull or glossy green with pointed tips. The middle leaflet is generally larger than the two laterals. The edges of the leaflets may be toothed, lobed, or smooth. Virginia Creeper (*Parthenocissus quinquefolia*) is non-poisonous vine with five leaflets that is often mistaken for poison ivy.



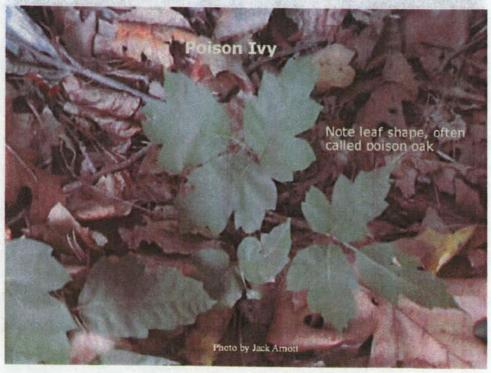
Poison ivy can be a shrub or a woody vine. Yellowish-green flowers occur in compact clusters in leaf axils, in June or July followed by waxy, gray-white berries about three-sixteenths of an inch in diameter in late summer.





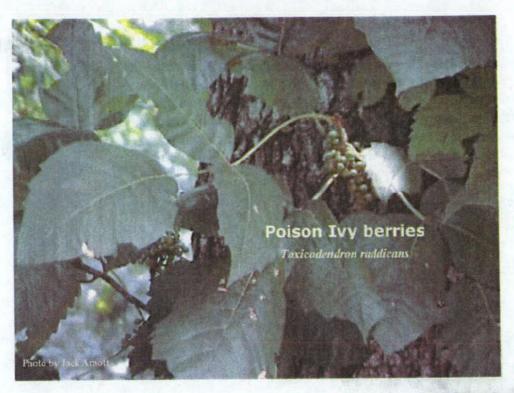
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Poison Oak

Poison oak also has three leaves. It grows in the sandy soil of the Southeast as a small shrub. In the western United States poison oak is a very large plant that grows as a standing shrub or climbing vine. Eastern poison oak has the most "oak-looking" leaves of any of the species. It usually has multi-lobed leaves, no aerial roots on the stems, and fuzzy fruits and leaves. It loves sandy soils. Western poison oak is found only along the Pacific coast and into the mountains and it usually has aerial roots extending from the main stem.

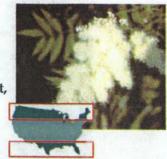


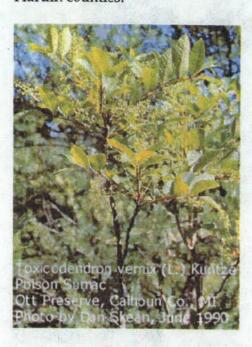


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Poison Sumac

A shrub or bush with two rows of 7-13 leaflets, most common in the peat bogs of the Northern United States and in swampy Southern regions of the country. A water loving swamp shrub (dendritic) or bush with two rows of 7-13 leaflets; growing from 6 to 20 feet in height, the Poison Sumac is found in the east from Quebec to Florida and westward along the coast to far west Texas between Shelby and Hardin counties.





Listed below are recommended actions to take to reduce the potential exposure to poisonous plant:

- Determine what types of poisonous plants may be present at the specific site.
- Use repellant sprays and coatings.
- Use netting or long sleeves with cuffs and long pants.
- Regularly inspect skin.
- Maintain a first aid kit on hand.



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Attachment 2 Insects





Chiggers, also known as "red-bugs" or "harvest mites", are the immature stages of a tiny red mite. They inhabit areas of tall grass, associated with low, wet spots, ponds and stream banks, wild berry patches, and forest underbrush. The larvae attach themselves to the clothing of people or to the fur of passing animals. Before settling down to feed, chiggers move to a constriction, such as sock tops, waistbands, or armpits. Feeding chiggers inject a salivary fluid, which dissolves the host's cells, and then they suck up the liquefied tissue. Within a few hours, small, reddish, intensely itching welts appear. These bites may continue to itch for several days up to two weeks after the chigger is dislodged. Following are suggestions that should provide some protection from chiggers:

- Stay out of areas where chiggers are likely to be present including wood lots, pastures, roadside ditches, or other areas with tall grasses and weeds. Chiggers are especially common in moist low-lying areas.
- Wear loose-fitting clothing (if possible) when working outdoors. Vehicles should be frequently vacuumed to reduce the number of chiggers that may have been deposited.
- Apply a repellent containing DEET to shoes, socks, and trousers before entering chigger-infested areas. Caution: some individuals may be sensitive to DEET - always read and follow label directions.
- Another repellant of chiggers is flowers of sulfur. Flowers of sulfur is powdered elemental
 sulfur available at a drug store or pharmacy as an over-the-counter preparation. It has a
 slight, rotten egg smell. Areas on the body that have tight clothing up against them such as
 socks, waistbands, etc. may be dusted with sulfur powder. Surveyors and other field
 personnel state that they fill a sock with sulfur and are able to dust these areas efficiently.



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Sulfur may be more benign to use than DEET on some body parts. Avoid breathing dust during application.

- Immediately after possible exposure to chiggers, take a bath, thoroughly scrubbing the body
 with hot soapy water. This will kill or dislodge many of the chiggers. The clothes that were
 worn when the bite(s) occurred should be placed in a plastic bag for temporary storage until
 they can be laundered.
- When bites begin to itch, one course of treatment is to apply rubbing alcohol, followed by
 one of the nonprescription local anesthetics. A baking soda paste, calamine lotion, or
 product such as "After-Bite" also will help reduce discomfort. Avoid scratching bites since
 this only increases irritation and may lead to a secondary infection of the bite.

Ticks

Ticks are vectors of many different diseases including Rocky Mountain spotted fever, Q fever, tularemia, Colorado tick fever, and Lyme disease. They attach to their host's skin and intravenously feed on its blood creating an opportunity for disease transmission. Covering exposed areas of the body and the use of tick repellent are two ways to prevent tick bites. Periodically during the workday employees will inspect themselves for the presence of ticks. If a tick is discovered, the following procedure should be used to remove it:

- Do not try to detach a tick with your bare fingers; bacteria from a crushed tick may be able to penetrate even unbroken skin. Fine-tipped tweezers should be used.
- Grip the tick as close to your skin as possible and gently pull it straight away from you until it releases its hold.
- Do not twist the tick as you pull and do not squeeze its bloated body. That may actually inject bacteria into your skin.
- Thoroughly wash your hands and the bite area with soap and water. Then apply an antiseptic to the bite area.
- Save the tick in a small container with the date, the body location of the bite, and where you
 think the tick came from.
- Notify the SSO of any tick bites as soon as possible.

Recently, Lyme disease has been the most prevalent type of disease transmitted by ticks in the United States.



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Spiders



A common venomous spider is the <u>Black Widow</u>. The adult female is glossy black with short, almost microscopic hairs and a crimson hourglass marking on the underside of the abdomen. They are found in dark corners of barns, stables, garages and piles of boxes and crates. They have also been known to reside in vacant rodent burrows, under stones, logs and long grass, and in hollow stumps and brush piles. Generally, Black Widows are not aggressive and usually can be induced to bite only if pressed against the skin. If disturbed, they typically will retreat to a corner of their web. However, these spiders are more aggressive if they are protecting an egg sac. After a bite, a dull numbing pain in the affected extremity occurs. In addition, pain and some muscular rigidity in the abdomen or the shoulder, back, and chest may occur. The bite may also produce headache, dizziness, skin rash, nausea, vomiting, anxiety and weakness, and increased skin temperature over the affected area may be observed. Ice may be placed over the bite to reduce the pain. Bites are rarely fatal to adults, but because the black widow spider injects neurotoxins, it is important to seek immediate medical attention.



Another venomous spider common in the southern United States is the <u>Brown Recluse</u> or Fiddle Back Spider. The Brown Recluse is about 1/4 to 1/2 inches in body length (most adults are about the size of a United States dime to a US quarter with legs extended). Coloration ranges from tan to dark brown, with the abdomen often darker than the rest of the body. The feature that most distinguishes the brown recluse from many other harmless spiders is a



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somewhat darker violin-shaped marking on top of the leg-bearing section of the body. The neck of the violin "silhouette" points towards the rear (abdomen) of the spider. The brown recluse roams at night seeking its prey. During the day, it hides in dark niches and corners, where it may spin a poorly organized, irregular web. Eggs are deposited in 1/2 inch long off-white silken egg sacs, often appearing flattened beneath and convex above. It is shy and will try to run from a threatening situation but will bite if cornered. People are sometimes bitten while they are asleep because they roll onto a brown recluse spider while it is hunting in the bed. More often the victim is bitten while putting on a shoe or piece of clothing that a spider has selected for its daytime hiding place. The bite of the brown recluse is usually painless until 3 to 8 hours later when it may become red, swollen, and tender. Later the area around the bite site may develop into an ulcerous sore from 1/2 to 10 inches in diameter. Healing often requires a month or longer, and the victim may be left with a deep scar. Prompt medical attention can reduce the extent of ulceration and alleviate other complications that may develop. It should be noted that not all brown recluse bites result in ulcerations or scarring.

Fire Ants

Fire ants are approximately 1/4-inch long and live in underground chambers that typically contain over 1,000 ants. One sure sign of the presence of fire ants is their conical mounds, which are a result of the digging of their chambers. The sting of a fire ant results in localized reddening of the bite area, accompanied by sharp burning sensations. The first ant sting releases a chemical substance that triggers other ants of the colony to sting. Anyone seeing fire ant mounds present at the work site should notify the SSHO, who will then notify the rest of the crew so the mounds may be avoided if possible.

Flying Insects

Flying insects such as mosquitoes, wasps, hornets, and bees may be encountered while site activities occur. Section 3.4.4 discusses problems associated with them. Mosquitoes can be the vectors for diseases such as the West Nile Virus and Saint Louis Encephalitis, reports of which appear in the media periodically. Avoiding mosquito bites is the best way to avoid potential exposure to mosquito-borne disease. Apply insect repellant containing DEET (N,N-diethyl-meta-toluamide), wear long-sleeved clothes and long pants treated with repellent and stay indoors during peak mosquito feeding hours (dusk until dawn) to further reduce your risk.

There is currently no vaccine to protect humans against Saint Louis Encephalitis or West Nile Virus. Individuals at project sites can reduce their risk from being infected with West Nile Virus by taking the following actions to protect against mosquito bites:

- Review the hazards of West Nile Virus periodically in morning safety meetings.
- Increase protective measures when working at dawn, dusk, and in the early evening.
- Reduce the area of exposed skin when working outdoors. Long-sleeved shirts with sleeves
 rolled down are recommended. Understand that mosquitoes may bite through thin clothing,
 so personnel should evaluate the actual Level D clothing worn, for example, heavy, long



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sleeve work shirts and heavy dungarees/jeans may be indicated. Activity at projects where disposable coverall use (i.e., Tyvek®) is specified, further reduces the risk of mosquito bites.

- For activities where only Level D PPE is specified, consider using disposable coveralls when working in wooded, highly vegetated, or swampy areas.
- Use an insect repellent containing approximately 30 percent DEET. In concentrations
 greater than 35 percent, DEET provides no additional protection. Use the repellent
 according to the manufacturer's directions provided on the container. Use just enough
 repellent to cover exposed skin and clothing. Do not treat unexposed skin. Frequent
 reapplication or saturation is unnecessary for effectiveness. Avoid prolonged and excessive
 use of DEET.
- When additional protection against mosquitoes is necessary, commercially prepared "clothing and gear" insect repellants containing 0.5 percent permethrin may be used. These repellants, such as Repel Permanone™ are available in the sporting goods departments at major retailers. Clothing and gear insect repellants are not for use on skin. Use the repellent according to the manufacturer's recommendations provided on the container.
- After returning from outdoor field activities, wash treated skin with soap and water.
- Personnel should report flu-like symptoms to the SSO.

West Nile Virus

The Centers for Disease Control and Prevention report that human illness from West Nile virus is rare, even in areas where the virus has been reported. The chance that any one person is going to become ill from a mosquito bite is low. West Nile virus is spread by the bite of an infected mosquito, and can infect people, horses, many types of birds, and some other animals. Most people who become infected with West Nile virus will have either no symptoms or only mild ones. On rare occasions, West Nile virus infection can result in a severe and sometimes fatal illness known as West Nile encephalitis (an inflammation of the brain). The risk of severe disease is higher for persons 50 years of age and older. There is no evidence to suggest that West Nile virus can be spread from person to person or from animal to person.

Saint Louis Encephalitis

The Centers for Disease Control and Prevention report mild infections occur without apparent symptoms other than fever with headache. More severe infection is marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, occasional convulsions (especially in infants) and spastic paralysis. There is no evidence to suggest that Saint Louis encephalitis can be spread from person to person or from animal to person.



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Table 1
Flying Insect Information

Organism	Description	Habitat	Problem	Severity	Protection
Hornet	One inch long with some body hair. Abdomen is mostly black.	Round, paper like nest hanging from trees, shrubs, or under eaves of buildings.	One nest may contain up to 100,000 hornets that will attack in force at the slightest provocation.	Severe pain, allergic reactions similar to bees.	Do not come near or disturb nest. If a hornet investigates you, do not move.
Mosquito	Small, dark, fragile body with transparent wings. From 1/8 to 1/4 inch long.	Where water is available for breeding.	Bites and sucks blood. Itching and swelling result.	Can transmit encephalitis and other diseases. Scratching causes secondary infections.	Use plenty of insect repellant and wear gloves. Stay in windy areas.
Wasp	Very thin waist. Color can be black, yellow or orange with stripes.	Underground nest. Paper-like honeycomb nest in abandoned buildings hollow trees, etc.	Stings. Some species will attack if you get too close to the nest.	Severe pain, allergic reactions similar to bees. Can be fatal.	Avoid Nest. Do not swat at them.
Bee	Generally have yellow and black stripes and two pair of wings.	Hollow logs, underground nest, old buildings,	Stings when annoyed. Leaves venom sac in victim.	If person is allergic, nausea, shock, constriction of the airway can result. Death may result.	Be careful and watch where you walk. Cover exposed skin. Avoid areas where bees are swarming. Avoid wearing sweet fragrances and bright clothing. Move slowly or stand still when bees are swarming about you.



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Attachment 3 Snakes

Copperhead





Coral



Cottonmouth





Diamondback Rattlesnake





Water Moccasin

The most effective way to prevent snakebites is to avoid snakes in the first place. Personnel should avoid walking at night or in high grass and underbrush. Visual inspection of work areas should be performed prior to activities taking place. The use of leather boots and long pants will be required, since more than half of all bites are on the lower part of the leg. No attempts at killing snakes should be made; many people are bitten in such an attempt.

If a snake bites someone, the following treatment should be initiated:

Keep patient calm



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- Notify emergency medical services
- Wash the wound and keep the affected body part still
- Apply direct pressure to site of bite if bleeding is extreme
- Keep the affected area lower than the heart
- Carry a victim who must be transported, or have him/her walk slowly
- Transport to closest medical facility



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Attachment 4 Other Natural Hazards

Alligators

Alligators live in nearly all Louisiana parishes but are most common in the major river drainage basins and large lakes in the southern portion of the state. Most attacks involve animals over six feet long. Alligators become more active in the beginning of March, peaking in May, which is their mating season. Females will nest in June - July, and the eggs will hatch in August and September. Even a small amount of impounded water may contain a large alligator. Twilight and night are prime times for alligator attacks. Never approach an alligator. Always stay at least 30 yards away. Never wade or swim in areas that could contain large alligators. Do not dump food or scraps into or near the water. This can attract alligators. Always be aware of your surroundings and use caution and common sense. If at any time personnel observe alligators at the site they will immediately inform the SSO, who will then notify the rest of the crew and local wildlife personnel.

Feral Animals

Feral animals such as rats or other wildlife may be encountered during fieldwork. Typically, feral animals are as afraid or more afraid of humans and when encountered will run away from human contact. However, if an animal is diseased, injured or tending a nest, they may become aggressive. The most common disease encountered with feral animals is rabies. Signs of a rabies-infected animal include:

- Changes in an animal's behavior;
- General sickness;
- Difficulty swallowing;
- An increase in drool or saliva;
- Wild animals that appear abnormally tame or sick;
- Animals that may bite at everything if excited;
- Difficulty moving or paralysis; and
- Death.

Animals in the early stage of rabies may not have any signs, although they can still infect you if they bite you. The incubation period is the time from the animal bite to when signs appear. In rabies, it is usually 1-3 months. However, it can last as long as several years. Once the virus reaches the brain or spinal cord, signs of the disease appear. In the event



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an animal is encountered on the site, do not approach it. If it exhibits one or more of the signs listed above, call local wildlife personnel to get as



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SCOPE

This procedure provides guidance for determining appropriate Personal Protective Equipment (PPE) to be worn at the job site, based on new tasks and chemical or physical agents identified in the field. The initial determination for proper PPE is completed as part of development of the HASP.

DEFINITIONS

None.

PROCEDURE

- A. The Site Safety Officer will complete a hazard assessment of the tasks involved and identify the appropriate PPE based on the task and the chemical or physical agents involved. The written hazard assessment certification must be documented in the HASP.
- B. The Site Safety Officer will communicate to employees the PPE requirements for the tasks involved.
- C. The Site Safety Officer will provide PPE that properly fits the employee(s).
- D. The site Safety Officer will conduct daily site walks to verify appropriate use of PPE.
- E. RCM Health & Safety Coordinator or the Site Safety Officer will provide training to the employees which includes at least the following:
 - 1. When PPE is necessary;
 - 2. What PPE is necessary;
 - 3. How to properly don, doff, adjust and wear PPE;
 - 4. The limitations of the PPE; and
 - 5. The proper care, maintenance, useful life and disposal of the PPE.
- F. Re-training by the Site Safety Officer may be required if:
 - 1. Changes at the job site make previous training obsolete.
 - 2. Changes in the types of PPE make previous training obsolete.
 - 3. Inadequacies in an affected employee's knowledge or use of PPE indicate the employee requires additional training.
- G. Types of PPE include the following:
 - Eye and Face Protection



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- a. All eye and face protection must comply with ANSI Z87.1-1989.
- b. Safety glasses
 - Side shields must be worn when there is a hazard of flying objects.
 - Prescription glasses must meet the ANSI Z87.1-1989 requirements or must have eye protection over them meeting the ANSI standard requirements.
- c. Chemical goggles
- d. Face shield
- 2. Head Protection
 - a. All head protection (hard hats) must comply with ANSI Z89.1-1989.
- 3. Foot Protection

All foot protection must comply with ANSI Z41-1991.

- Safety-toed shoes
- b. Rubber boots or rubber safety-toed boots
- 4. Hand Protection

Hand protection must be selected based on the performance characteristics of the hand protection relative to the task(s) to be performed, conditions present, duration of use and the hazards and potential hazards identified. The RCM Health and Safety Coordinator must verify and document selection of appropriate chemical resistant gloves.

- a. Work gloves, such as leather or cotton
- b. Chemical gloves, such as nitrile, neoprene, Viton, butyl rubber
- c. Cut-resistant gloves, such as Kevlar
- 5. Hearing Protection
 - a. Ear plugs
 - b. Ear muffs
- 6. Respiratory Protection (Refer to SOP 9)
- 7. Other PPE
 - a. Disposable Coveralls
 - b. Fire Resistant Clothing

REFERENCES

Regulatory References

- 29 CFR 1910.132, Personal Protective Equipment, General Requirements
- 29 CFR 1910.133, Eye and Face Protection
- 29 CFR 1910.135, Head Protection



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- 29 CFR 1910.136, Foot Protection
- 29 CFR 1910.138, Hand Protection

Technical References

- ANSI Z87.1-1989, American National Standard Practice for Occupational and Educational Eye and Face Protection
- ANSI Z89.1-1989, American National Standard for Personal Protection Protective headwear for Industrial Workers Requirements
- ANSI Z41-1991, American National Standard for Personal Protection Protective Footwear

Procedural References

• SOP - 9, Respiratory Protection

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SCOPE

This procedure identifies the work practices and regulatory requirements regarding drum handling at the jobsite.

DEFINITIONS

None.

PROCEDURE

- A. When handling drums, follow the general drum handling requirements listed below:
 - 1. Hazardous substances and contaminated, liquids and other residues must be handled, transported, labeled, and disposed of in accordance with 29 CFR 1910.120(j).
 - 2. When practical, drums and containers must be inspected and their integrity must be assured prior to being moved.
 - Unlabeled drums and containers must be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled.
 - 4. Drums must be handled only if necessary. Prior to handling, all personnel should be warned about the hazards of handling and instructed to minimize handling as much as possible.
 - 5. Drums and containers that cannot be moved without rupture, leakage, or spillage must be emptied into a sound container using a device classified for the material being transferred.
 - 6. A ground-penetrating system or other type of detection system or device will be used to estimate the location and depth of buried drums or containers.
 - 7. Soil or covering material must be removed with caution to prevent drum or container rupture.
 - 8. Fire extinguishing equipment meeting the requirements of 29 CFR Part 1910, Subpart L, must be on hand and ready for use to control incipient fires.
- B. When opening drums and containers, such as for sampling or waste characterization purposes, handling shock sensitive wastes, radioactive wastes, or when shipping drums, the RCM Health and Safety Coordinator must develop a site specific drum handling plan to be included in the HASP

REFERENCES

Regulatory References

29 CFR 1910.120(j), Handling Drums and Containers



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• 29 CFR 1926.65(j), Handling Drums and Containers

Technical References

None

Procedural References

• ERM Corporate Health and Safety Program, Drum/Container/Cylinder Handling Procedures

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SCOPE

This procedure provides requirements and safe work practices for personnel involved in excavation work. Please review the Excavation Safety Checklist (Attachment 1) in verifying that this procedure is being followed.

DEFINITION

- <u>Accepted Engineering Practices</u> those requirements, which are compatible with standards of practice required by a registered professional engineer.
- Benching (Bench System) a method of protecting employees from cave-ins by
 excavating the sides of an excavation from one or a series of horizontal levels or steps,
 usually with vertical or near-vertical surfaces between levels.
- <u>Cave-in</u> -the separation of a mass of soil or rock from the sides of an excavation, or the
 loss of soil from under a trench shield or support system, and its sudden movement into
 the excavation, either by falling or sliding, in sufficient quantity to entrap, bury, or
 otherwise injure and immobilize a person.
- <u>Competent Person</u> one who is capable of identifying existing and predictable hazards
 in the surroundings, or working conditions which are unsanitary, hazardous, or
 dangerous to employees, and who has authorization to take prompt corrective measures
 to eliminate them
- <u>Excavation</u> any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.
- <u>Face or Sides</u> the vertical or inclined earth surfaces formed as a result of excavation work.
- <u>Hazardous Atmosphere</u> an atmosphere which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful, may cause death, illness, or injury.
- <u>Protective System</u> -a method of protecting employees from cave-ins, from material that
 could fall or roll from an excavation face or into an excavation, or from the collapse of
 adjacent structures. Protective Systems include support systems, sloping and benching
 systems, shield systems, and other systems that provide the necessary protection.
- <u>Registered Professional Engineer</u> a person who is registered as a professional engineer in the state where the work is to be performed.
- <u>Shield (Shield System)</u> -a structure that is able to withstand the forces imposed on it by
 a cave-in and thereby protect workers with in the structure. Shields can be permanent
 structures or can be designed to be portable and moved along as work progresses.



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- <u>Shoring (Shoring System)</u> a structure such as a metal hydraulic lift, mechanical or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.
- <u>Sloping (Sloping System)</u> –a method of protecting employees from cave-ins by
 excavating to form sides of an excavation that are inclined away from the excavation.
 The angle of incline required to prevent a cave-in varies with differences in factors such
 as the soil type, environmental conditions of exposure, and application of surcharge
 loads.
- <u>Support System</u> means a structure such as underpinning, bracing, or shoring, which
 provides support to an adjacent structure, underground installation, or the sides of an
 excavation.

PROCEDURE

- A. Prior to the start of excavation, the Construction Manager must complete the ERM subsurface clearance procedure to verify clearance of subsurface hazards at the excavation site. Subcontractor Contact should identify the location of utility installations (e.g., sewer, telephone, electric, water lines, etc.) that may be expected to be encountered during excavation.
 - 1. Contact the utility company (-ies) and advise of proposed work requesting them to establish the location of the underground installations.
 - Underground installations must be protected, supported, or removed as necessary to safeguard employees.
- B. When equipment is operated adjacent to an excavation or is required to approach the edge of an excavation, a warning system, such as barricades, hand or mechanical signals, or stop logs must be utilized. The system should be inspected:
 - 1. Prior to the start of work and as needed throughout the shift.
 - After every rainstorm or other site condition change that could increase the instability of the excavation.
- C. To prevent exposure to harmful levels of atmospheric contaminants or oxygen deficiency (atmospheres containing less than 19.5% oxygen), the following requirements apply:
 - The atmospheres in the excavation must be tested before employees enter excavations greater than 4 feet in depth per SOP 10 Confined Space Entry
 - 2. The proper respiratory protection should be provided per SOP 9 Respiratory Protection.



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- When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing must be conducted as often as necessary to verify that the atmosphere remains safe.
- D. Emergency rescue equipment, such as breathing apparatus, a safety harness and line, or a basket stretcher, must be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. The equipment should be attended when in use.
- E. Employees should not work in excavations where water has accumulated or is accumulating, unless protective measures such as special support or shield systems to protect from cave-ins have been implemented to protect the employees against the hazards posed by water accumulation.
 - If water is controlled or prevented from accumulating by the use of water removal equipment, a competent person must monitor the water removal equipment and operations.
 - Diversion ditches, dikes, or other suitable means must be used to prevent surface water from entering the excavation and to provide drainage of the area adjacent to the excavation.
 - Excavations subject to runoff from heavy rains require an inspection by a competent person.
- I. Stability of other structures endangered by excavation operations must be stabilized by support systems such as shoring, bracing, or underpinning for the protection of employees. A registered professional engineer should be consulted for determination of stability of structures that may be affected during the excavation work.
- K. Subcontractor Contact should verify materials and equipment are free from damage or defects that might impair their proper function.
- L. Daily inspections of excavations, the adjacent areas, and protective systems must be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. A helpful excavation safety checklist is provided as Attachment 1.

<u>ATTACHMENT</u>

Excavation Safety Checklist

REFERENCES

_9
ERM

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Regulatory References

- 29 CFR 1926.650 Scope, Application, and Definitions Aapplicable to this Subpart (Subpart P).
- 29 CFR 1926.651 Specific Excavation Requirements.
- 29 CFR 1926.652 Requirements for Portective Systems.

Technical References

None

Procedural References

ERM's Subsurface Clearance Procedure

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ATTACHMENT 1: EXCAVATION SAFETY CHECKLIST

Job Site Prior to starting the job, were utilities notified and underground services located?	Yes □	<u>No</u> □	NA	Excavation Have the supervisors and workers been trained in excavation safety laws and procedures?	Yes □	<u>No</u> □	NA
Were overhead transmission lines noted and precautions taken to ensure that equipment does not come in contact with them?				Have building, utility poles, trees and any other surface encumbrances or destabilizing forces been taken into consideration?			
Have adequate signs been posted and barricades provided?		· 🗖		Has soil classification been done?			
Are the workers wearing reflective vests, if necessary?			· · · · · · · · · · · · · · · · · · ·	Has the appropriate means of safeguarding the excavation by OSHA requirements been determined by a Competent Person?			
Are vehicles, equipment, and spoil piles correctly placed to allow for the safe passage of traffic and the progress of the construction?				For excavations 4 feet (1.2 meters) deep or more, are ladders, steps or ramps available within 25 feet (7.6 meters) of lateral travel?			
Has traffic control (fire depts., etc.) been notified?				Are all open pits or shafts either covered or barricaded?		0	



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<u>Job Site</u> Is the appropriate safety gear on site?	<u>Yes</u> □	<u>No</u> □	NA	Excavation Are spoil piles at least 2 feet from the edge of the excavation and properly sloped?	Yes □	<u>No</u> □	NA □
Have undermined structures been shored, braced or underpinned, or has a registered Prof. Engineer determined that such measures are not necessary?				Have confined-space atmospheric hazards been considered?			
Are utilities crossing the excavation supported from above and does protection from falling materials exist?				Do bridges and walkways have standard guardrails?			
	-		· .	Have means been provided to remove water from the excavation?			
				Competent person available on site at all times.			

NOTE:

Shoring and shielding must be removed in a manner that ensures the safety of workers, and excavations must be back filled as soon as work is completed.



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SCOPE

This procedure provides work practices to meet regulatory requirements regarding fall prevention/fall protection for all employees working 6 feet or more above a lower level.

DEFINITIONS

None.

PROCEDURE

- A. Fall prevention/protection is required when there is an unprotected side or edge which is 6 feet or more above a lower level. Example situations include but are not limited to:
 - Horizontal walking/working surfaces;
 - Leading edges;
 - Holes in flooring or walls;
 - 4. Formwork and reinforcing steel;
 - Ramps, runways and other walkways;
 - Excavations;
 - 7. Roof work;
 - 8. Precast concrete erection; and
 - Walking/working surfaces not otherwise addressed.
- B. In addition, protection from falling objects must also be provided to employees working below, by requiring the use of head protection as well as one of the following methods:
 - Erect toeboards, screens or guardrail systems to prevent objects from falling from higher levels; or
 - Erect a canopy structure and keep potential objects far enough from the edge so they would not go over if they were accidentally misplaced; or
 - 3. Barricade the area into which the objects could fall and prohibit employees from entering into the barricaded area.
- C. Where fall prevention, in the form of a physical barrier, is not feasible, and a fall hazard exists, fall protection is mandatory. Fall protection can take on many forms depending on the job task being performed, i.e., permanent and temporary vertical and horizontal lifeline systems, full body harness, shock absorbing lanyards, nets, retractable devices, etc. These are some of the most common methods of fall protection available.
- D. In the event work is to be conducted at a height greater than 6 feet, fall prevention and/or fall protection requirements must be incorporated into the HASP. The RCM Health and Safety Coordinator must develop a fall prevention/protection plan which



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will incorporate the use of physical barriers, administrative controls or fall protection equipment.

E. Additionally, training must be completed for any individual who will be using fall prevention / fall protection equipment. The Site Safety officer must verify all workers have received the appropriate training relative to fall prevention / fall protection.

REFERENCES

Regulatory References

- 29 CFR 1926.501, Duty to Have Fall Protection
- 29-CFR 1926.502, Fall Protection Systems-Criteria and Practices

Technical References

None

Procedural References

None

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SCOPE -

This procedure provides guidance on meeting regulatory requirements and provides expectations for the safe use, and handling of forklift/ trucks.

DEFINITIONS

None.

PROCEDURE

A. TRAINING

- The Construction Manager should verify that each forklift/ truck operator is trained and certified to operate a fork lift / truck per the requirements of 29 CFR 1910.178 Powered Industrial Trucks.
- 2. Refresher training in relevant topics shall be provided when the operator:
 - a. Is assigned to drive a different type of truck
 - b. Operates the forklift in an unsafe manner
 - c. Experience an incident
- 3. Operators shall be required to be re-evaluated at least once every three years.

B. INSPECTIONS

- 1. Prior to operating a forklift, the operator shall examine the unit for conditions that adversely affect the safety of the vehicle.
- A lift truck found to be unsafe to operate shall have the ignition key removed and a
 "OUT OF SERVICE" tag attached to the steering wheel, noting the unsafe condition
 or reason it has been taken out of service.
- 3. Any truck found with a tag must be repaired before being used.

C. OPERATION

- Forklift/ truck shall be operated in accordance with the manufacturer's operating procedures and regulatory requirements.
- 2. The lifting capacity of the forklift/ truck should not be exceeded. Capacities are located on a plate attached to the truck.
- An unstable load should never be lifted.
- 4. Obey all signs and warnings.
- 5. Lifting personnel for repairs or maintenance shall be done only in approved cages or platforms.
- 6. Forklifts have a high center of gravity and should be driven slowly around turns and curves to prevent rollover.
- 7. Spread the forks out as far as they will go when picking up material. Also, if the forks are longer than the load, be careful not to disturb what is behind the load.
- 8. Never allow anyone to stand or walk under a raised load.
- 9. Before moving the truck, check to make sure that there are no obstacles in your way.



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- 10. Always turn your head when backing up. Mirrors are to see what is behind you while moving forward.
- 11. Come to a complete stop before changing directions.
- 12. Drive extra slow on wet and slippery surfaces.
- 13. The seatbelt must be worn at all times.
- 14. Never dismount the forklift while it is running.
- 15. Never leave a load raised.
- 16. Never drive on a slope with a raised load.
- 17. Always drive perpendicular to a slope
- 18. Always verify the ability of surfaces to support the equipment before operating the forklift/truck non non-paved surfaces

REFERENCES

Regulatory References

• 29 CFR 1910.178 Powered Industrial Trucks

Technical References

None

Procedural References

None

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SCOPE

This procedure defines minimum expectationse for the safe use and maintanence of tools and equipment, including tools and equipment which may be furnished by employees.

DEFINITIONS

Torque: The circular or rotating motion in tools such as drills, impact wrenches, saws, etc. which results in a strong twisting force

PROCEDURE

A. HAND TOOLS

- 1. Every tool was designed to do a certain job and employees should use tools only for their intended purpose.
- 2. Maintain hand tools in good condition sharp, clean, oiled. .
- 3. Do not force tools beyond their capacity or use "cheaters" to increase their capacity. Do not use tools for pry bars.

B. PORTABLE POWER TOOLS

1. GUARDING

Guards or shields must be installed on all power tools before issue. Do not use improper tools or tools without guards in place.

C. OPERATING PRACTICES

- 1. Loose clothing, rings, and other jewelry must not be worn around operating machines. Keep sleeves buttoned or rolled up.
- 2. Keep fingers away from moving parts. Shut off machines to remove waste. Use a brush to clean up and debur. Be sure machine is fully stopped and not coasting.
- 3. Inspect at least daily before start-up. Look for loose or damaged parts and inadequate lighting.
- 4. Use clamps or vise to hold work.
- 5. Many machines have Safety Interlocking devices. Verify their operation prior to use, and NEVER BYPASS SAFETY INTINTERLOCK DEVICES.
- 6. Examine each power tool before using it. Look for damaged parts, loose fittings, frayed or cut electric cords. Tag and return defective tools for repairs.



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- 7. Some machines use both pneumatic and electric power. Both must be shut off to make repairs or to adjust moving parts. Bleed down tool to remove any stored energy left in the system.
- 8. Be prepared in case of jamming. Maintain good footing; and use two hands, Circular saws, chain saws and percussion tools shall not be equipped with a locking switch or trigger
- 9. Flying objects can result from operating almost any power tool. Be aware of others working around you and use proper eye protection.
- 10. Keep moving parts directed away from your body. Never touch a powered part unless power source is disconnected (such as drill chucks, blades, and bits).
- 11. Ground Fault Circuit Interrupters (GFCI) are required when using electrical power tools.

REFERENCES

Regulatory References

- 29 CFR 1910.241 Definitions.
- 29 CFR 1910.242 Hand and Portable Powered Tools and Equipment, General.
- 29 CFR 1910.243 Guarding of Portable Power Tools.
- 29 CFR 1910.244 Other Portable Tools and Equipment.
- 29 CFR 1926.300 General Requirements.
- 29 CFR 1926.301 Hand Tools.
- 29 CFR 1926.302 Power-operated Hand Tools.

Technical References

None

Procedural References

SOP 08 Personnel Protective Equipment

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SCOPE

This procedure defines requirements for safe operation of heavy equipment operation. Heavy equipment includes backhoes, cranes, derricks, dozers, loaders, skid steers, and trucks.

DEFINITIONS

- <u>Crane</u> means a mechanical device, intended for lifting or lowering a load and moving it horizontally, in which the hoisting mechanism is an integral part of the machine. A crane may be a fixed or mobile machine.
- <u>Derrick</u> A "derrick" is an apparatus consisting of a mast or equivalent member held at the head by guys or braces, with or without a boom, for use with a hoisting mechanism and operating ropes.

PROCEDURE

A. TRAINING

1. Equipment operators must demonstrate training and experience with each piece of equipment before receiving authorization to begin work.

B. INSPECTION

- 1. All heavy equipment must meet applicable design standards (i.e., ANSI, etc.).
- 2. The equipment must have a copy of the most recent annual and periodic inspections onboard.
- 3. The Subcontractor Contact or a designated qualified person must inspect all heavy equipment prior to operation (See Crane and Derrick Inspection Checklist), to verify proper working condition.
- 4. A copy of the manufacturer's operating manual must be carried on all heavy equipments. The manual must include a load-rating chart that indicates safe loads in various configurations, wire and cable minimums and maximums, and any special operating considerations.

C. <u>OPERATION</u>

- The Subcontractor must have a standard operating procedure that is implemented for heavy equipment operation.
- 2. Equipment must be operated in accordance with the manufacturer's instructions and recommendations.



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- 3. Before starting equipment, the equipment operator must make sure no one is working on or near the machinery. If equipment must be operated in close proximity to other operations, a spotter will be required to work with the equipment operator. The spotter and equipment operator must be in radio communication
- 4. Equipment operators must wear seatbelts and operate equipment in accordance with safe operating speeds and loading
- 5. When working on slopes, the equipment should be positioned perpendicular to the slope with the center of gravity of the equipment on the lower edge of the slope.
- 6. Dump trucks must lower their beds **PRIOR** to moving from the dump site
- 7. All employees should wear appropriate personal protective equipment in accordance with SOP 8 Personal Protective Equipment.
- 8. Equipment operators should not get on or off a moving machine.

Note: If heavy equipment is located near overhead power lines, refer to SOP – 12 Electrical Safety to determine safe working distances.

ATTACHMENTS

Crane and Derrick Inspection Checklist

REFERENCES

Regulatory References

- 29 CFR 1910.181 Derricks.
- 29 CFR 1926.550 Cranes and Derricks.
- 29 CFR 1926.600 Equipment.
- 29 CFR 1926.601 Motor Vehicles.
- 29 CFR 1926.602 Material Handling Equipment.

Technical References

None

Procedural References

RCM SOP – 8 Personal Protective Equipment RCM SOP – 12 Electrical Safety



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ATTACHMENT 1

CRANE AND DERRICK INSPECTION CHECKLIST

Prior to operation each day, inspect:

- 1. All control mechanisms for maladjustment interfering with proper operation. 2. All control mechanisms for excessive wear of components and contamination by lubricants or other foreign matter. All operator aids, motion and load limiting devices, and other safety devices for 3. malfunction and inaccuracy of settings. 4. All chords and lacing. 5. All hydraulic and pneumatic systems - with particular emphasis given to those which flex in normal operation of the crane. Hooks and latches for deformation, chemical damage, cracks, and wear. 6. 7. Rope for proper spooling onto the drum(s) and sheave(s) and rope reeving for compliance with crane manufacturer's specifications. 8. Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt, and moisture accumulation. 9. Hydraulic system for proper oil level. 10. Tires for recommended inflation pressure (mobile cranes). 11. Wedges and supports for looseness or dislocation (climbing tower cranes). 12. Braces and guys supporting crane masts; anchor bolt base connections for looseness or loss of preload (tower cranes and derricks). Derrick mast fittings and connections for compliance with manufacturer's 13. recommendations.
- Barge or pontoon ballast compartments for proper ballast; deck loads for proper securing; chain lockers, storage, fuel compartments, and battening of hatches; fire fighting and lifesaving equipment in place and functional; hull void compartments sounded for leakage (floating cranes and derricks).



STANDARD OPERATING PROCEDURE			
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SCOPE

This procedure provides guidance on the control hazardous of energy to prevent injury to employees due to unexpected start-up or release of stored energy.

DEFINITIONS

Affected Employee

Any employee whose job requires them to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout/tagout or whose job requires them to work in an area in which such servicing or maintenance is being performed.

Authorized Employee

Any employee who locks out or initiates a tagout procedure on machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance covered under this procedure.

Circuit Breaker

Switch (housed in a distribution panel) controlling the flow of electricity (on/off) to the electrical equipment.

Control Switch

The switch controlling the flow or electricity between the disconnect switch source and the electrical equipment. Also called:

- Start-Stop button.
- b. Butterfly switch.
- c. Control station.

Disconnect Switch

Switch (normally housed in an electrical control room) controlling the flow of electricity (on/off) to the equipment and its control switch. This switch is also called:

- Combination starter switch.
- Switch and starter.

Zero Mechanical or Energy State

That state of a machine in which every power source that can produce machine member movement has been locked out. This includes blocking, controlling or isolation of electric, kinetic or potential energy sources

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Multi-Lockout Devices

A multi-lockout hasp mechanism which can be used so more than one lock can be attached during a lockout. Lock boxes are another alternative for using multiple locks.

Personal Lock

A safety lock used by authorized personnel that is durable and capable of withstanding excessive force. Any authorized employee uses it to lock out equipment. All locks will be on a "One Lock, One Key, One Employee" system.

Tags

A standard tag signed and dated shall be attached to the individual's lock. The tag shall be attached by passing the grommet through the lock shackle. The legend on the tag shall read, "DANGER, DO NOT OPERATE". Tags shall be capable of withstanding the environment to which they are exposed for a maximum period of time that exposure is expected.

PROCEDURE

- The Construction Manager shall inform the affected party responsible for the machinery or equipment being repaired or serviced that the equipment needs to be shut down so it can be locked out, tagged out and tried (electrical only).
- 2. The authorized party shall be responsible for the de-energizing switches, circuit breakers, pneumatic valves, or hydraulic valves, which control the operations of machinery or equipment that contains or ever contained hazardous energy.
- 3. Prior to the start of any work, all machines and equipment must be brought to a "zero mechanical/energy state. The Authorized Employee conducting the lockout should attempt to activate ("Try") the equipment with the starting device, to verify the equipment does not show any sign of stored energy.
- Each authorized employee shall remove their personal lock and tag when they have completed their job and are no longer required to perform any other task on the equipment.
- 5. When work continues beyond the shift, an individual's lock and tag may remain in place if the Site allows. However, when returning to continue the work, each individual shall check their own lock and tag prior to starting work. Each individual must re-date their tag daily through out the duration of the job. The redating will confirm that the individual checked their personal lock, assuring the equipment remains locked out.
- Shift change and new crews coming in requires the change-out of locks and tags.

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A. GROUP LOCKOUT

- 1. When it is impractical because of the magnitude or complexity of large jobs such as major facility shutdown or overhaul, group lockout can be utilized.
 - a. The Construction Manager shall be responsible for arranging the shutdown for energized equipment to be locked and tagged out.
 - b. The Subject Matter Expert shall apply locks and tags to all disconnect switches to be worked on.
 - c. The keys shall be placed in a group lockbox or comparable mechanism. It shall have a hasp and keeper, which will permit application of a "Lockout Device" so it can accommodate more than one lock.
 - d. Each authorized employee shall affix their personal locks and tag with their name and date to the "Lockout Device" on the "Group Lockbox".
 - e. Each authorized employee is to test by "Trying" the control switch to assure the equipment has been electrically de-energized before starting work.

REFERENCES

Regulatory References

29 CFR 1910.147 The Control of Hazardous Energy (Lockout/Tagout).

Technical References

None

Procedural References

None

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Subsurface Clearance Requirements

Appendix D

12 November-2010 Project No. 0042525 North Penn Area 2 Superfund Site Hatfield Township, Pennsylvania

Subsurface Clearance

ERM Health & Safety

14 September 2009

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Environmental Resources Management

Subsurface Clearance

14 September 2009

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1.0 INTRODUCTION

1.1 SCOPE

This Process provides Safe Work Practices for subsurface obstruction and utility clearance (collectively, Subsurface Clearance or SSC for short). This Process must be used to prevent injury to ERM employee and avoid contact with Subsurface Structures prior to any ERM project-related Ground Disturbance Activities.

1.2 LOCAL AMENDMENTS

This Process has been developed to be broadly applicable across all of the jurisdictions in which ERM operates. However, it may sometimes be necessary to augment portions of this Process by taking into account applicable legislative or regulatory requirements within the jurisdiction of the work. The provisions for doing so may be described within a project Health & Safety Plan, Job Hazard Analysis or other device. Compliance with such requirements is not optional.

1.3 DEFINITIONS

- <u>Contact Person</u> a representative of the site where Ground Disturbance
 Activities will be conducted. The Contact Person may be a Client
 employee or the employee of a third party. The degree to which the
 Contact Person is "knowledgeable" about subsurface conditions at the
 site may be assessed by considering that individual's time at the site, time
 in current job, and / or job-related duties.
- <u>Critical Zone</u> 10 feet (3 meters) distance in all directions from the surface projection of all <u>known or suspected</u> underground pipes, cables, edges of tanks, pump islands, pump galleries, manifolds, electrical transformers, compressors, production wells, loading racks, or other process equipment with associated underground pipes and/or cables.
- <u>Detection Equipment</u> technology used for the detection of Subsurface Structures including devices that utilize electromagnetic detection, ground penetrating radar, thermal detection and others.
- Excavation Buffer a 2-foot (0.6-meter) distance in all directions from Subsurface Structures <u>not otherwise prepared and designated for removal</u> that will be exposed or partially exposed due to excavation-type Ground Disturbance Activities. The material within the Excavation Buffer will not be removed by means of mechanical digging.

- Ground Disturbance Activities activities which require penetration of the ground surface deeper than 1 foot (0.3 meter) or the removal of surface pavement. Ground Disturbance Activities include, but not limited to: hand digging, drilling, hand auger, direct-push drilling, excavation, trenching, concrete coring, driving of posts, stakes, rods, or poles, and grading.
- Non-Conductive Tools for purposes of use in a Physical Clearance Method, tools with fiberglass, composite or fully-insulated handles and potential contact surfaces (e.g., the T-handle and top flight of a hand auger).
- Physical Clearance Methods methods used to identify the presence or absence of Subsurface Structures at a particular location by removal of overburden and direct observation and / or contact. Common Physical Clearance Methods include: hand digging, hand augering, probing, compressed air excavation or "air knifing," pressurized water excavation, etc. Physical Clearance Methods should-always be used in conjunction with Detection Equipment. Hand tools used with any Physical Clearance Method must have a non-conductive handle or a handle made nonconductive by proper insulation.
- Site Services Model a depiction of the below ground utilities and services that are present, absent or unaccounted for at a site. The Site Services Model is revised in the field as additional information is derived from discussions with the Contact Person, observation of visual clues, utility markouts and other sources.
- SSC Experienced Person an ERM employee who will ensure execution of the Subsurface Clearance process both in the office and in the field. Though not required, it is a best practice for the SSC Experienced person to be present on site through the completion of Ground Disturbance Activities.
- Subsurface Structures man-made structures beneath the surface of the ground. Common Subsurface Structures include, but are not limited to: tanks, drums, pipelines (water, natural gas), electrical cables, fiber optic telecommunication cables, sewers, etc.
- <u>Useful Property</u> a criteria for determining a "Property Damage"-type Incident. Useful property is a Subsurface Structure that, if broken, an ERM Client or other third party would pay to have repaired.

1.4 **MODEL TOOLS**

Model tools are available to facilitate the execution of the SSC Process. These tools, presented in Appendix A, include:

- <u>Subsurface Clearance Process Checklist (the "Checklist")</u> used to document the execution of the SSC Process broadly for all disturbance locations visited as part of a work mobilization.
- <u>Subsurface Clearance Location Disturbance Permit (the "Permit")</u> used to document the execution of the SSC Process at a specific ground disturbance location. The Permit is required at locations known or suspected to be in a Critical Zone. It is a recommended best practice to use the Permit at all disturbance locations.
- <u>Level 2 WARN Health & Safety Plan Template for Intrusive Work</u> minimum HASP template used on projects where the SSC Process is utilized.

2.0 SSC PROCESS REQUIREMENTS

2.1 PERSONNEL & TRAINING REQUIREMENTS

- 1. SSC General Employees. ERM employees working on projects where Ground Disturbance Activities are performed must have fulfilled the following training requirements:
 - a. Classroom Subsurface Clearance training, and
 - b. Annual 1-hour Subsurface Clearance Refresher Training, as appropriate.
- 2. SSC Experienced Persons. At least one person in each ERM field team must be an SSC Experienced Person, having been designated as such by either:
 - a. Designation by an ERM Branch Manager at the time of hire or inception of the Subsurface Clearance Mentoring Process, or
 - b. Completion of SSC Mentoring, and, if applicable, the SSC Field Training Course (which is an optional requirement that may be instituted by local ERM businesses).

2.2 EQUIPMENT REQUIREMENTS

Equipment specific to Subsurface Clearance includes:

- 1. A hand auger non-conductive or stainless steel with insulated handles and upper shaft
- 2. Probe non-conductive or insulated upper shaft
- 3. Cable Avoidance Tools (Ground Penetrating Radar, C.A.T., etc.)

The Safe Work Practices that comprise the SSC Process are presented below. They are summarized graphically in flowchart at the end of this Section.

3.1 PRE-PROJECT

- 1. Request that the Client identify a Contact Person knowledgeable of the subsurface at the work location. If available, the Contact Person should personally assist in identifying safe ground disturbance locations.
- 2. Ensure subcontractors that will be used (if any) meet ERM's minimum safety criteria and understand their role in the SSC Process.
- 3. The ERM Project Manager will assign a "SSC Experienced Person" who will fulfill the duties outlined above, and will:
 - a. Have current SSC Classroom / annual refresher training (as appropriate).
 - b. Lead the review of the SSC Process with all ERM personnel and subcontractors prior to initiating site work.
 - c. Mentor less experienced ERM employees at the jobsite.
- 4. Ensure that assigned ERM project staff have satisfied the Training Requirements defined herein.
- 5. As necessary, assess the potential for the presence of unexploded ordinance (UXO) or munitions of explosive concern (MEC).
 - a. If UXO/MEC is present or potentially present, specialist technical assistance must be obtained to assist with pre-planning and clearance.
 - b. Ensure that project field staff receive "Recognize, Retreat, Report" training customized for the situation at the site.

3.2 OFFICE ACTIVITIES

- 1. Health and Safety Planning.
 - a. At a minimum, a Level 2 WARN Health and Safety Plan (HASP) for Intrusive Work must be developed prior to initiating ground disturbance field activities.

- b. Other applicable ERM Safe Work Practices and / or policies must be appended to the HASP for field reference.
- c. Any Client- and / or Site-specific excavation and safe work permit requirements must be understood and implemented.
- d. If ERM personnel will operate Detection Equipment, attach a record of their latest Detection Equipment training to the HASP.
- e. The HASP must be reviewed, approved and signed by the PIC and the PM prior to initiating activity on site.
- f. ERM's HASP must be reviewed and signed by the field team, including ERM employees and ERM subcontractors.
- 2. Historical Information Review. The Project Manager or designee should:
- —a. Obtain the most recent as-built drawings and/or site plans (including subsurface structures) as available.
 - b. Seek to obtain any additional site-related information such as easements, right-of-ways, historical plot plans, fire insurance plans, tank (dip) charts, previous site investigations, soil surveys, boring logs and aerial photographs, etc., as relevant to the planned ground disturbance activities.
 - c. Summarize available information sources in the Subsurface Clearance Information Summary in the HASP.
 - d. Site Services Model. Assemble information about Subsurface Obstructions, Utilities and Services into a preliminary Site Services Model.
 - i. Identify the presence / absence of known or suspected subsurface services at the work location in general (i.e., everything within the property boundary).
 - ii. Identify the routes and locations of known services.
 - iii. Identify the "gaps" services suspected or not located based on currently available information.
 - iv. To the extent practicable, identify the locations of key isolation devices and shutoff valves.
- 3. Identify preliminary Critical Zones and / or Excavation Buffers on one or several site drawings or sketches.

- 4. Develop an initial disturbance location plan (boring location map, excavation plan, etc.) accounting for Critical Zones, Excavation Buffers, gaps in surface information and project objectives.
- 5. If any disturbance locations (or boundaries of disturbance areas) fall within a Critical Zone, the <u>preferred course of action will be to move the location / boundary outside the Critical Zone</u>.

3.3 FIELD ACTIVITIES: PRE-CLEARANCE

- 1. Site Walk. The SSC Experienced Person must personally oversee a visual survey of the disturbance locations and surrounding areas to identify signs of potential underground obstructions and utilities.
 - a. The findings and approvals received during the site walkover must be documented in one of the following (collectively, the Documentation):
 - Broadly for the site on the Subsurface Clearance Process Checklist (the Checklist),
 - On the Location Disturbance Permit (the Permit), which has the level of detail required for locations known or suspected to be within a Critical Zone, or
 - iii. With equivalent notes and sketches (Field Notes) in a bound field log book.
 - b. If there is a Contact Person and he /she is available, he / she should *ideally* accompany the SSC Experienced Person on the site walk *and* will approve the disturbance locations.
 - Ideally, the Contact Person should indicate approval of the disturbance locations by providing his/ her signature on the Documentation.
 - ii. If verbal approval is given by the Contact Person, note the date and time at which such approval was given in the Documentation.
 - Note any other information provided by the Contact Person or other site representatives in the Documentation.
 - c. Particular attention should be paid to confirming the routes / locations of services identified and those unaccounted for in the Site Service Model using visual clues, which include, but are not limited to the following:

- Utility poles with conduit leading to the ground
- Lights
- Signage
- Sewer drains/cleanouts
- Cable markers
- Utility boxes
- Manholes
- Pavement scarring
- Pipeline markers

- Remote buildings with no visible utilities
- Fire hydrants
- Sprinkler systems
- Water meters
- Natural gas meters
- Sewer manholes and drop inlets
- UST fill ports and vent pipes, and
- Steam lines
- d. Confirm overhead clearances for safely deploying equipment to the location.
- 2. Utility Markouts. Utilities must be marked out using an available combination of Public Utility or Private (i.e., ERM subcontractor provided or ERM self performed) location services, except as allowed below.
 - a. Public Utility Markouts.
 - i. Where available and/or required by local legislative or regulatory requirements, the public utility locator <u>must be</u> <u>called</u> to mark utilities at the site.
 - ii. A site map including planned work areas should be made available to the public utility locator if possible.
 - iii. Waiving the need for Public Utility Markouts.
 - 1. Only the PIC may waive this requirement, provided that he / she is:
 - a. Legally able to do so, and
 - b. Reasonably assured that it is safe to grant the Waiver, based on the guidance herein (see Section 4.1) and consultation with the SSC Experienced Person and project team.
 - 2. The Waiver decision <u>must be</u> documented in the HASP and alternative measures <u>must be</u> taken and documented (also in the HASP) to ensure the safety of ERM employees.
 - 3. In the absence of a Public Utility Markout or on private property, a Private Utility Markout must be performed to mark utilities at the site.

- b. Private Utility Markouts.
 - Hire a private utility locator to locate and mark utilities on the project site (this is the preferred course of action). The private utility locator must meet minimum ERM health & safety criteria.
 - ii. Where private utility locator services are not available for hire, utilize a trained ERM employee to conduct the utility location using a rented or ERM-owned locator tool. The locator tools utilized by ERM employees must:
 - 1. Be maintained according to manufacturer specifications with maintenance records available.
 - 2. Be calibrated according to manufacturer specifications. Calibrations must be documented.
 - 3. Be calibrated or tested at the start of each work day.
 - iii. Waive the need for Private Utility Markouts.
 - 1. Only the PIC may waive this requirement, provided that he / she is:
 - a. Legally able to do so, and
 - b. Reasonably assured that it is safe to grant the Waiver, based on the guidance herein (see Section 4.1) and consultation with the SSC Experienced Person and project team.
 - The Waiver decision <u>must be</u> documented in the HASP and alternative measures <u>must be</u> taken and documented (also in the HASP) to ensure the safety of ERM employees.
- c. Utilities should be marked with paint or other semi-permanent markings whose meaning is understood by the site team.
- Final Critical Zone Determination and Location of Disturbance Points or Areas.
 - a. Use the information gathered from the pre-planning work, site walk and utility markouts to determine the Critical Zones near each disturbance location.

- b. Though it is highly recommended for all ground disturbance locations, it is <u>required</u> to compile Critical Zone information using the Permit or with equivalent Documentation for locations known or suspected to be inside a Critical Zone.
- c. Critical Zone determination must be reviewed and approved by the SSC Experienced Person.
- d. If a disturbance location is confirmed inside a Critical Zone, then:
 - i. The preferred course of action will be to move the disturbance location to a safe location outside the Critical Zone.
 - ii. If Ground Disturbance Activity absolutely must proceed within the Critical Zone, then it must be explicitly authorized by the PIC provided that:
 - 1. He / she is reasonably assured that it is safe to allow_that activity, based on the guidance herein (see See Section 4.1.1) and consultation with the SSC Experienced Person and project team,
 - If possible, energized pipes or cables within the Critical Zone are de-energized via a formal Lockout/Tagout program, and
 - 3. Ground Disturbance Activities at that location do not present an unacceptable safety, environmental, or operational risk, either on-site or off-site.

3.4 FIELD ACTIVITIES: POINT DISTURBANCE CLEARANCE

Note: Examples of Point Disturbances include soil borings, monitor wells, etc.

- Re-verify overhead clearance at ground disturbance locations prior to initiating clearance activity.
- 2. In the case of sites where UXO / MEC risks are present, adhere to the clearance plan developed by the specialist provider, which will supersede item 3 below.
- 3. Physical Clearance.
 - Utilize a Physical Clearance Method to ensure the absence of Subsurface Structures at each ground disturbance location. Some jurisdictions require that Detection Equipment be used in conjunction

with Physical Clearance Methods (it is always a best practice to do so).

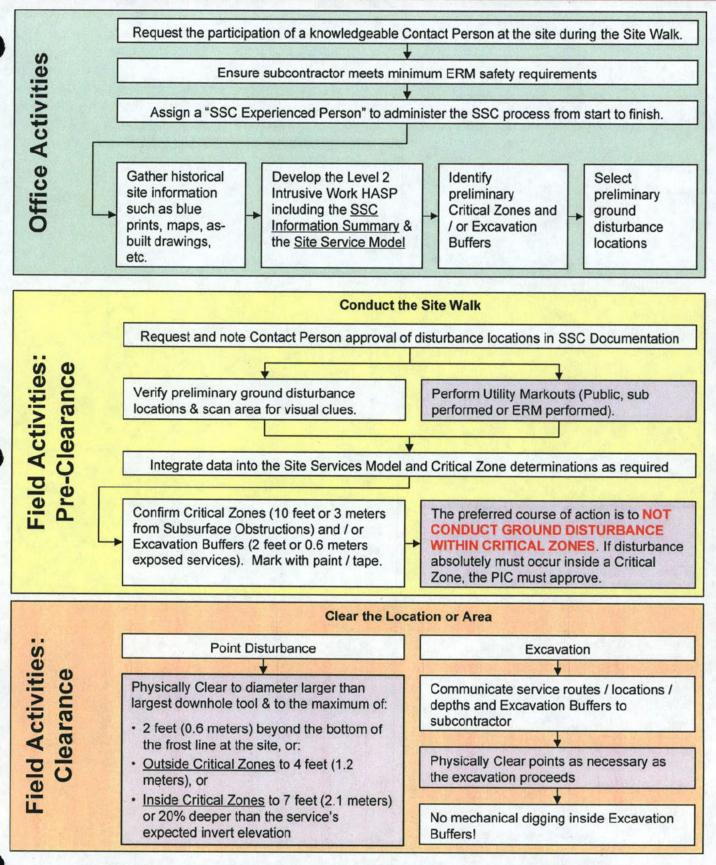
- b. Physical Clearance must be performed to the maximum of the following:
 - 2 feet (0.6 meters) beyond the bottom of the frost line at the
 - Based on the location of the disturbance point:
 - 1. Inside Critical Zones:
 - a. To 7 feet (2.1 meters), or
 - b. To 20% deeper than the known or suspected invert elevation of the Subsurface Structure.
 - 2. Outside Critical Zones, to 4 feet (1.2 meters)
- c. Physical Clearance must also exceed the diameter of the largest tool (e.g. drilling auger, direct-push sampler, ream) to be advanced and be sufficiently large to allow obstructions to be inspected visually. (A best practice rule of thumb would be 10% - 20% larger than the largest tool.)
- d. Waiving the Physical Clearance requirement.
 - i. Only the PIC may waive this requirement, provided that he / she is:
 - 1. Legally able to do so, and
 - Reasonably assured that it is safe to grant the Waiver, based on the guidance herein (see Section 4.1) and consultation with the SSC Experienced Person and project team.
 - ii. The Waiver decision must be documented in the HASP and alternative measures must be taken and documented (also in the HASP) to ensure the safety of the field team.

3.5 FIELD ACTIVITIES: EXCAVATION/TRENCHING CLEARANCE

1. Re-verify overhead clearance at ground disturbance locations prior to initiating clearance activity.

- 2. In the case of sites where UXO / MEC risks are present, adhere to the clearance plan developed by the specialist provider, which will supersede items 3-6 below.
- 3. Using the data from the HASP, Site Services Model and other information from the Site Walk and Utility Markouts, the SSC Experienced Person will identify in the Subsurface Clearance Checklist & Disturbance Permit or other equivalent notes in a bound field logbook:
 - a. The locations at which Subsurface Structures cross through or are located inside the excavation perimeter.
 - b. The routes of services crossing through the excavation perimeter and the expected excavation depths to the 2-foot (0.6-meter) Excavation Buffer around those services or other Subsurface Structures.
 - c. To the extent practicable, the SSC Experienced Person should work with the Contact Person to-de-energize-identified services-prior to commencing excavation.
- 4. The SSC Experienced Person will inform the excavation subcontractor of information regarding the location of Subsurface Structures. Mechanical digging will be restricted in the Excavation Buffer.
- Additional hand clearance by use of non-conductive tools / probe rods should be used as necessary to identify the presence / absence of Subsurface Structures as the excavation proceeds.
- 6. Removal of material inside the Excavation Buffer may only proceed by hand using non-conductive tools.

Subsurface Clearance (SSC) Process Flow Chart



REPORT ALL SAFETY EVENTS PROMPTLY PER HASP INSTRUCTIONS

4.0 ADDITIONAL SSC PROCESS GUIDANCE

4.1 WAIVER GUIDANCE

There are four Waivers to the SSC Process that may potentially be issued by a PIC:

- Requirement for Public Utility Markouts,
- Requirement for Private Utility Markouts (performed by ERM Subcontractors or ERM employees),
- Requirement for Physical Clearance, and
- Restriction of Ground Disturbance Activities within Critical Zones.

PICs are expected to work with the SSC Experienced People and broader project teams to ensure the SSC Process is executed and to use available information to make safe decisions regarding Waivers to the SSC Process.

The guidance to issue waivers to components of the SSC process can be summarized as follows:

- Waivers should only be issued when exceptional circumstances (e.g., rigid project requirements, technical infeasibility, etc.) limit the execution of parts of the SSC Process. Waivers cannot be issued solely for cost reasons.
- Only PICs can issue Waivers, based on consultation with the SSC Experienced Person and others on the project team.
- 3. PICs cannot waive compliance with any legislative or regulatory requirement applicable within the jurisdiction of the work.
- 4. PICs cannot waive compliance to client-mandated requirements without prior discussion with and approval by the client.
- 5. PICs should integrate the following considerations into their decisions to issue a waiver:
 - a. Available lines of evidence about the services present in the subsurface.
 - b. Relative hazard of striking the services known or suspected (i.e., not confirmed as absent from the site).
 - c. Multiple / high-quality lines of evidence and low relative hazard support granting Waivers. Limited / low-quality lines of evidence and high relative hazard do not support granting Waivers, as shown in the Waiver Matrix (next page).

- d. For Ground Disturbance Activities within Critical Zones:
 - The default stance in ERM's SSC Process is to NOT advance borings or proceed with excavations in a Critical Zone.
 - ii. If disturbance absolutely must occur in a Critical Zone, then the following factors must be considered:
 - The ability to de-energize the lines of concern via a formal Lockout/Tagout program, and/or
 - Safety, environmental, or operational concerns, either onsite or off-site, that arise from Ground Disturbance Activities in the Critical Zone.
- 6. All Waiver decisions must be recorded in the Health & Safety Plan.

The Waiver Matrix

Lines of Evidence / Quality

		Less	More
Relative Striking th	Higher	Likely Not	Caution
Relative Hazard of Striking the Service	Lower	Caution	Likely OK

Additional guidance on issuing Waivers and illustrative examples of Waiver decisions are presented in Appendix B.

4.2 SSC-RELATED SAFETY EVENTS

 For internal management purposes, ERM will classify Subsurface Clearance-related Safety Events with a "Subsurface Clearance" classification as follows:

- a. Incident: Any injury, illness, damage to useful property or spill as the result of striking a Subsurface Structure sustained either during the clearance process or the Ground Disturbance Activity itself.
- b. Near Miss: Any surprise contact with the following either during the clearance process or the Ground Disturbance Activity itself:
 - i. Useful property which is verified as not damaged.
 - ii. Any other verified Subsurface Structure.
 - iii. "Refusal" caused by rocks, difficult geology or other natural matter IS NOT a Near Miss. Step out locations should be in a safe direction and cleared consistent with the Subsurface Clearance process.
- c. Unsafe Act: Any action, whether inadvertent or deliberate, that serves to contradict or reduce the protections to health and safety offered by this Subsurface Clearance Process.
- d. Unsafe Condition: Any condition, whether inadvertently or deliberately created and / or permitted to exist, that serves to contradict or reduce the protections to health and safety offered by this Subsurface Clearance Process.
- e. Remarkable Safe Behavior: Any action that serves to significantly enhance the protections to health and safety above and beyond those offered by this Subsurface Clearance Process.
- 2. In the case of an Incident or a Near Miss, the SSC Experienced person will:
 - a. Suspend all related ERM and ERM Subcontractor action on site.
 - b. Work to stabilize or address the situation and gather initial facts.
 - c. Promptly report the Safety Event to the PIC and PM, who will ensure that such Events are noted in appropriate reporting systems and that appropriate parties are notified.
 - d. Restart work only with the concurrence of the PIC and PM.

SUBSURFACE CLEARANCE PROCESS MENTORING

Subsurface Clearance (SSC) Process Mentoring complements the Classroom, Refresher and Field Training components of the ERM SSC process and enables a framework to provide the real-world experience necessary to help make employees well-versed in SSC activities.

5.1 ERM PERSONNEL INVOLVED IN THE MENTORING PROGRAM

The main types of ERM employees involved in the SSC Mentoring Program are described below.

5.1.1 SSC General Employees

5.0

The label of "SSC General Employee" describes any ERM employee who is:

- Working on a project site that requires the use of ERM's SSC process, and
- <u>Not</u> otherwise designated as "SSC Experienced Person" for the purposes of this program.

Upon the designation of an ERM employee as a SSC General Employee:

- He / she will be provided with a "SSC Mentorship Card".
- The designation "SSC General Employee" will be added to the employee's training database record.

SSC General Employees will potentially be mentored by different SSC Experienced Persons, depending on project assignments.

5.1.2 SSC Experienced Persons

The cornerstone of the SSC Mentoring Program is existing ERM "SSC Experienced Employees", who serve as the mentors in the program.

SSC Experienced Persons are:

- Experienced in SSC-related issues,
- Identified in the safety training database with the designation "SSC Experienced Person",
- Required to be involved in offsite planning for SSC projects and present on jobsites where SSC process are being performed.

It is during work on these jobsites that mentoring will occur, as described below.

5.1.3 Branch Managing Partners

Branch Managing Partners of General Employees will approve the "graduation" of General Employees from the SSC Mentoring Process to become SSC Experienced Persons, provided that training requirements are met.

5.2 MENTORING CURRICULUM

The SSC Experienced Person will mentor SSC General Employees in as many of the following topics that apply to his/her particular project.

5.2.1 Pre-Project & Office Activity Mentoring

Several important steps in effective planning for SSC projects occur prior to any activities in the field. SSC Experienced Persons will ensure SSC General Employees receive instruction in the following:

- Assessing knowledge of client contacts
- Assigning project personnel with appropriate experience
- · Assigning project personnel with appropriate training
- Assess unexploded ordinance

Specific to SSC activities to occur on a project site, SSC Experienced Persons will ensure that SSC General Employees receive instruction in the following:

- WARN preparation for SSC projects
- Reviewing available historical information
- Developing a project-specific Site Services Model

5.2.2 Field Activity Mentoring

Once offsite planning has been completed and an ERM team mobilizes to a jobsite involving SSC hazards, the SSC Experienced Person shall ensure that SSC General Employees receive guidance in the following topics:

- Conducting the site walk, emphasizing visual identification of potential SSC locations
- Completing the SSC Checklist and Disturbance Permit
- Public and private utility location concerns
- Rational of choosing particular types of Cable Avoidance Tools for project-specific conditions
- Critical zone determinations
- Clearing single/multiple ground disturbance
- Clearing excavations/trenches
- Thorough discussion of rationale of PIC waivers directly associated with the project

Proper reporting of SSC safety events

5.3 DOCUMENTATION OF MENTORING RECEIVED

The SSC General Employee is responsible for asking the SSC Experienced Person to sign his / her SSC Mentorship Card at the completion of their involvement in the project.

The SSC Experienced Person's signature will denote:

- The SSC Experienced Person's satisfaction that a substantial subset of the above curriculum was successfully covered during the execution of the project assignment, and
- That the assignment completed without Injuries.

5.4 "GRADUATION" AND BECOMING A SSC EXPERIENCED PERSON

After obtaining 5 – 10 signatures on the SSC Mentorship Card, the SSC General Employee may request that his/her local Branch Managing Partner "graduate" them from the process.

The Branch Managing Partner will consider the request and will consult with the various SSC Experienced People and project Partners involved. The Branch Managing Partner may determine that:

- Sufficient mentoring has occurred and the SSC General Employee is prepared to exit or "graduate" from the mentoring program, or
- Additional project experience and mentoring is required, meaning that the SSC General Employee will remain in the mentoring program.

If the SSC General Employee has "graduated", then he / she will become an SSC Experienced Person. Such will be noted in the employee's safety training database record.

Appendix A Model SSC Process Tools



Subsurface Clearance Field Process Checklist

Site Name:	
Client:	
ERM Project No.:	
SSC Evn Person	

	AND THE RESERVE AND THE		med in						
Project Basics		10.8 S. S.		Yes	No	N/A	Co	mments	
Contact Person requested and identified		TOTAL STATE		Odd wa		1000			
Subcontractors meet ERM's minimum saf	The same of the sa	100							
Subcontractors understand their role in th		A Marie						E 12 May	hale
SSC Experienced Person with current SS									TY W
Project staff with current SSC training ass					11.10		STORY OF STREET		
JXO / MEC risks assessed: UXO / MEC	IS NOT present								
Seneral Field Activity & Site Walk				Yes	No	N/A	Co	mments	N. Harris
ASP read, understood and signed by pre	oject team	A STATE OF							
Site walk Visual Clues / site features (bel		Site Service	s Model						
Identified Visual Clue	Yes	No			Identi	fied Vis	ual Clue	Yes	No
ights			Pipeli	ne mark	ers				
Signage				ydrants		1	I DE		
Sewer drains / cleanouts			Sprint	ler syst	ems	Lance II		23 13 100	
Cable markers			Water	meters					
Itility poles with conduit leading to the gro	ound		Natur	al gas m	eters	STERN.			
Jtility boxes			UST	ill ports	and ver	nt pipes			
Manholes			Stean	lines					
Pavement scarring			Remo	te buildi	ngs wit	h no visi	ble utilities		
contact Person Approval of Ground Di	isturbance Location	ns (indicate	verbal appr	oval by	printing	"Verbal	" in the signature	space)	
Contact Person Approval of Ground Di Name (Print)	isturbance Location Company	ns (indicate	verbal appr	oval by		"Verbal		space) Date / Time	
Name (Print)		ns (indicate	verbal appr	Name	(Sign)		D	Date / Time	
Name (Print) Pre-Clearance		ns (indicate	verbal appr			"Verbal	D		
Name (Print) Pre-Clearance Public Utility Markout completed		ns (indicate	verbal appr	Name	(Sign)		D	Date / Time	
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Name (Print)

Name (Sign)

Last Rev: Sept. 2009 English Version

Date / Time



Subsurface Clearance **Location Disturbanc** Permit

e verb	al approval by printing "Verbal" in	the signature space)		
	Location Designation: ERM Project No.: SSC Exp. Person: erbal approval by printing "Verbal" in the signature space)			
	SSC Exp. Person:			
	ERM Project No.:	up - L		
3				

	ound Disturbance Locations (indicat	e verbal approval by printing "Verbal" in the	e signature space)
Name (Print)	Company	Name (Sign)	Date / Time
Critical Zone Determination an	d Clearance Depth (It is not preferred	to initiate Ground Disturbance Activities w	ithin a Critical Zone)
If the Disturbance Location is known or suspected to fall within a Critical Zone, then a sketch (see reverse) or other map must be used to confirm proximal Critical Zones.	Clearance will proceed to the dee level, or 20% deeper than the en	Charge is aware & approved disturbance aper of: 0.6m / 2 feet below the frost line, expected invert elevation of the service of the deeper of: 0.6m / 2 feet below the f	2.3m / 7 feet below ground
Physical Clearance Technique Cleared using the following None. Waived by PIC. (I	Ensure documentation in the HASP.)		
Reason:			
		Di	ate / Time:
Physical Clearance Executed 8	Observed By:	Di	ate / Time:
Physical Clearance Executed 8 Company	Observed By: Representative(s)	Date / Time Complete	ate / Time:
Company Was any Subsurface Structure	Representative(s) discovered (damaged or undamage Discussed with PIC (Date / Time Complete d) during Clearance?	
Company	Representative(s) discovered (damaged or undamage Discussed with PIC (Date / Time Complete d) during Clearance?	
Company Was any Subsurface Structure	discovered (damaged or undamage Discussed with PIC (s)	Date / Time Complete d) during Clearance?	
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Company Was any Subsurface Structure No (Proceed) Yes	discovered (damaged or undamage Discussed with PIC (s)	Date / Time Complete d) during Clearance?	

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(Optional) Critical Zone Determination Sketch

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structions:

- Create a sketch of the disturbance (in the space to left or attach) that contains the following information:
 - The disturbance location
 - Surface landmarks and overhead obstructions (buildings, roads, overhead lines, etc.)
 - Critical landmarks and Subsurface Structures (tanks. transformers, wells, racks, etc.)
 - Underground services:
 - Identified in the HASP Site Service Model
 - Marked by Public or Private utility markouts
 - iii. As relayed by the Contact Person
 - iv. Nearest shutoff / isolation mechanism for each
 - e. Any surface clues as to potential underground services (junction boxes, drains, disturbed concrete, signage, etc.)
 - The site property boundary
- Use your sketch to mark Critical Zones (3m or 10 feet) around critical landmarks and underground structures / services.
- For Excavations, use your sketch to mark Excavation Buffers (0.6m or 2 feet) from Subsurface Structures.
- If the disturbance location falls inside the Critical Zone, the preferred course of action is step out to a safe location outside a Critical Zone.
- Disturbance within a Critical Zone can only proceed with PIC approval.



Level 2- Short Form PROJECT HEALTH AND SAFETY PLAN FOR INTRUSIVE WORK

This form is intended to provide health and safety guidelines for project field activities where Ground Disturbance Activities (i.e., Intrusive Work) will be conducted, and where:

- The PIC and PM judge that the Short Form provides sufficient level of risk assessment and management
- A more detailed HASP is not required by law or the Client
- · The work does not require complicated interactions with subcontractors
- The work is of relatively short duration such as 1-14 days
- The activities described below should be conducted using good work practices and judgments consistent with employee training.

The Project Manager and PIC must ensure that all project personnel review and sign this form, and document these activities in the project file. Their signatures indicate approval of methods and precautions in this plan.

Also attach Specific Task Hazard Assessment Sheet(s) and Subsurface Clearance Checklists as necessary

Administrative	Site Name, Owner and Location:	
Information		
	Client:	
	Project Name:	Project GMS Number:
	Health & Safety Plan Date:	Revision Number and Date:
	Project Field Work Start Date:	Anticipated Project Field Work End Date:
Property Commence	Project Manager:	Partner-in-Charge:
	Project Manager (approval signature):	Partner-in-Charge (approval signature):

Site/Project General Information	Scope of Work:
	Site History:
Develop a Task Hazard Analysis Sheet for each	Site Description:
Information Develop a Task Hazard Analysis	Site Hazard Assessment Summary (Summarize major bullet points from the attached Task Hazards Analysis sheet(s)):
	Precautions For Preventing Contractor-Equipment Related Incidents:

Subsurface	Information Source	Yes	No	N/A	Comment
Clearance Information Sources Summary Document the information	Facility-provided Map(s) of Utilities				Date(s):
	Knowledgeable Contact Person				Who: Time in Job: Time at Site:
sources that ERM used or will use to locate Subsurface Structures on site.	Public Utility Markouts				Who: Tech. Used: Target Services:
	ERM [1] or ERM subcontractor performed geophysics / cable avoidance scans			my2.	Who: Tech. Used: Target Services:

[1]: If ERM personnel will be performing any Private Utility Markouts, attach the operating employee's most recent equipment training record to the HASP.

Site Services	Utility / Service	Pres-	Expect.	Lo	cated?	Abs-	Un-	Comment
Model	Offitty/ Service	ent	Depth	Yes	No	ent	known	Comment
List the utilities or other below	Electricity							
ground services present on site.	Gas							
Do we know the	Water							
services, their	Sewer							Asia Salah
(to the site boundary, as	Telephone / Data			11 120				
the location of	Plant air / steam							
locations of these services, their conveyance on site (to the site boundary, as appropriate) and the location of isolation switches or valves?	Fuel / oil							
If "Present" and not located or "Unknown",	Fire suppression							
comment on how those gaps will be addressed.	Others (List):							

Attach a figure / drawing showing the conveyance and isolation switches or values for each located utility or service above.

Subsurface	Waiver For	Waived By (PIC)	Date	Reason
Clearance Process Waivers	Performance of Public Utility Markouts		To	
Document any waivers to the process approved by the PIC. Legally required steps cannot be waived.	Performance of Private Utility Markouts			
	Restricting ground disturbance inside a Critical Zone			
	Physical Clearance at Disturbance Locations (list)	100		

Chemicals of Concern	Chemical Name	PEL/ TLV	H	ighest Repor Concentratio	Site Location / Source			
		ILV	Air	Water Soil				
						* - ** .		
	·							
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Air Monitoring Action Levels	Constituent	Action Level (ppm)	Level of Protection	Monitoring Instrument						
	Acute Chemical Issu	es								
	Oxygen									
If air monitoring is	H2S									
necessary to	C2S									
control acutely hazardous issues	Dusts									
on site, document	VOCs:									
the short-term										
limit that requires		,								
response	Others:									
If exposures to	Long-Term Chemical Issues									
chronic chemical	Metals									
exposure concerns is necessary;	Dusts			·						
document the	Others:	·								
levels at which		•	·							
actions are required										
				·						

PPE Level of				Level		
Protection Required by	Task Description	A	В	C	Mod D	D
Work Task				Ī .		
					-	

Personal	Equipment	Req	Rec	NA	Equipment	Req	Rec	NA
Protective Equipment	Steel Toe Boots				Indirect Vented (Splashproof) Goggles			
Components Required	Outer Disposable Boots				SCBA			
	Coveralls or Long Sleeve Shirt & Pants				Full-face Airline Resp.			
Req = Required Rec =	Tyvek Suit				Full Face Negative Pressure Resp.			
Recommended NA = Not	Poly-coated Tyvek / Saranex Suit	,			Half Face Negative Pressure Resp			
Applicable NOTE:	Fully Encapsulated Chemical Suit			-	Powered Air Purifying Resp			
Required PPE is built from a	Hearing Protection	,			Other:			
minimum base of Hard Hat, Safety	Leather Gloves							
Glasses and Leather Boots	Outer Chemical Gloves	,					,	
	Inner Chemical Gloves				-			

Some countries (U.S.) require documentation of the PPE needs assessment and certification of the selection process. If this applies, please complete below:

Name of PPE Assessor/ Certifier:

Date of Assessment/Certification:

Work Zones	Exclusion Zone:
If exclusion zones are necessary	
because of chemical OR	Contamination Reduction Zone:
equipment hazards, describe the plan.	
the plant	Support Zone:
Site	<u> </u>
Access/Control	
How do we limit unauthorized entry	
to the site itself?	
Decontamina- tion Procedures	
How will personnel and	
equipment be decontaminated prior to leaving the	
Site?	

Safety Events	The occurrence of Safety requirements. At a mini Communication System required.	mum, Safety Events	will receive follow-	up per the ERM Event						
Emergency Contacts	Name and Address of Nearest Hospital:									
Complete this section if medical	Hospital Phone Number	:								
and emergency response support is not KNOWN to	Route To the Nearest Ho	ospital: (Write out / d	raw or attaclı map)							
be fully available through on-site client personnel										
	Other Contact Information									
	Agency	Contact	Location	Phone Number						
	Police Dept									
	Fire Dept/ Ambulance									
	Electric Utility									
	Plant Contact			· · · · · · · · · · · · · · · · · · ·						
	Client Contact		·							
	Project Manager									
	Project H&S Officer	·								
To the state of the second state of the second seco	Site Safety Officer									

Health & Safety Plan Evaluation Complete after the Field Work is done-	To evaluate the effectiveness of the responsive to unexpected situation should complete the following an Health and Safety Leader and other than the statement of the statement	ns, the d file a	Projec copy o	t Mana	ger or entire o	Site Sa	fety Of	ficer				
place in the file and	Actual Dates of the Field Tasks:	S Plan										
send suggested		follo	wed as	Prese	nted?	Adec	լuate?					
improvements to the		Yes		No		Yes		No				
H&S Leader	·			ľ	<u> </u>	<u> </u>						
	Describe in detail any changes to the H&S Plan while on-site:											
				·								
					. "							
	Reason For Change:											
								•				
				ı								
	What Changes Would You recom	mend:										
								•	•			
		•										
Signatures	Project Manager (If other than the	e PM)				Dat	e:					
									-			
						 	<u> </u>					
	Project Health and Safety Officer (If other than the PM) Date:											
	Site Safety Officer (If other than the	ne PM)				Dat	e:					
		٠.	٠									

Acknowledgement	This Health & Safety Plan has been discr have been given opportunity to ask ques	ussed with me. I unders	stand its content, and
Printed Name	Signature	Company	Date
			. ,
			· .
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Appendix B Additional Waiver Guidance and Examples

APPENDIX B Additional Waiver Guidance and Examples

Introduction

"Reasonably assured" denotes the standard that must be satisfied for PICs to grant Waivers to the execution of (or, more precisely, make an explicit decision to allow non-performance of) portions of the Subsurface Clearance (SSC) process, including:

- · Private utility markouts;
- Public utility markouts (ERM- or subcontractor-performed);
- · Physical clearance; and
- Restriction of Ground Disturbance Activities within a Critical Zone.

This guidance is intended to present a risk-based framework through which being "reasonably assured" may be assessed.

Definition and Two Factors to Consider

Being "reasonably assured" means that one would make the same decision as another PIC would concerning a Waiver based on the same set of factors. These factors include:

- The lines of evidence established (or not) about subsurface risks, and
- The relative hazard of striking the services known or suspected below ground.

Multiple / high-quality lines of evidence and low relative hazard support granting Waivers. Limited / low-quality lines of evidence and high relative hazard do not support granting Waivers, as shown in the Waiver Matrix, below.

The Waiver Matrix

Lines of Evidence / Quality

		Less	More
Relative I Striking th	Higher	Likely Not	Caution
Relative Hazard of Striking the Service	Lower	Caution	Likely OK

The way in which those factors are considered is illustrated by example below.

Example Project

An ERM team has been awarded a project to assess suspected impact at an idled manufacturing site. The Client previously demolished all surface structures, but did not fully address the process sewer. Some surface clues are present. They are assigned to go in and perform 25 soil borings along the run of the former process sewer (due to regulatory requirements, samples must be taken within 1 m of the sewer lines) looking for potential impact. The site is known to be constructed over made ground, and debris – both from historical operations and the recent demolition – is widespread over the site in the 0-1m interval.

The SSC Process first asks the project team to take stock of the project's information sources about subsurface risks. This is memorialized in the Subsurface Clearance Information Sources Summary (part of the Health & Safety Plan Template). Before mobilizing to the field for the drilling and sampling activity, the Information Summary is as follows.

Example Project SSC Information Sources Summary (Pre-Mobilization for Drilling Works)

Subsurface	Information Source	Yes	No	N/A	Comment
Clearance Information Sources	Facility-provided Map(s) of Utilities	x			Final as-built from 2005 prior to site demolition
Summary Document the information	Knowledgeable Contact Person			x	Site is redundant. No client or site reps available.
sources that ERM used or will use to locate Subsurface Structures on site.	Public Utility Markouts	×			Marked out at the street on
	ERM [1] or ERM subcontractor performed geophysics / cable avoidance scans		×		None planned. Seeking waiver by PIC.

[1]: If ERM personnel will be performing any Private Utility Markouts, attach the operating employee's most recent equipment training record to the HASP.

The more information sources that are checked "Yes" indicates more lines of evidence potentially established. Comments regarding the quality or reliability of those lines of evidence should also be noted and weighed in subsequent decisions. Note that, at present, the project team intends to ask the PIC to waive the Private Utility markout.

Project teams are also asked to cycle through the potential underground services at a site. The goal is to ultimately confirm either their presence or absence of such services from the work area. The relative hazard of striking a service can be prioritized in terms of the potential severity of such a strike in terms of bodily harm, followed by potential cost implications of repair. All other things being equal, a prioritized list of common below ground services – from high hazard to low hazard – at a site might include:

- 1. High / medium voltage cables
- 2. Low voltage cables
- 3. Pressurized gas lines
- 4. Other pressurized pipelines
- 5. Fiber optic cables
- 6. Gravity drain process sewers
- 7. Gravity drain sanitary sewers
- 8. Gravity drain storm sewers

Of course, the particular circumstances of the site (e.g., active facility, idled facility, greenfield) and whether or not the routes of the services are known or would meet the definition of "Useful Property" may change the relative hazard ranking. The presence / absence and knowledge of the routes of below ground services on the Example Project site is noted in the Site Services Model, below.

Example Project Site Services Model (Pre-Mobilization for Drilling Works)

	Utility / Service	Pres-	s- Expect.	Loc	cated?	Abs-	Un-	Comment
Site Services	Othrty / Service	ent	Depth	Yes	No	ent	known	Comment
Model	(1) HV / MV Electricity	x	2m	x		h.		De-energized from substation
List the utilities or other below	(2) LV Electricity						x	But not anticipated outside ofc footprint
ground services present on site.	(3) Pressurized Gas	x	2m	x				Present on site, but blinded at street
Do we know the locations of these	(4) Other Pressurized Lines	x	1m		x			H: pipeline crosses fmr: process area
services, their conveyance on site	(5) Fiber Optic communication					×		Per phone company, none on-site
(to the site boundary, as appropriate) and	(&) Process Sewer	×	1-2 m	×				Deactivated, but not abandoned
the location of isolation switches or valves?	(≠) Sanitary Sewer	×	?		x			Deactivated, cut and blinded at street
If "Present" and	(8) Storm Sewer					x		Previously abandoned by client
not located or "Unknown", comment on how								
those gaps will be addressed.				La hele	drawn			

Attach a figure / drawing showing the conveyance and isolation switches or values for each located utility or service above.

Example Project Waiver Decisions

Decisions on granting Waivers should be based on considerations on what is known (or will be known, based on planned work activity) and what risks are present by virtue of the identified services at the site.

In this case, there are three potential Waiver decisions for the PIC to make:

- Waiving the private utility mark-out,
- Waiving the need for physical clearance, and
- Advancing within Critical Zones (within a 3m envelope of a sewer line).

The thought process includes weighing the lines of evidence against the relative hazard of the services known or suspected. In the end, the PIC must ask himself / herself if they are reasonably assured that the decision to grant a Waiver is a safe one. Consultation with the SSC Experienced Person and others project team may assist the PIC in making the decision. In the end, the PIC is the only one who may grant a Waiver.

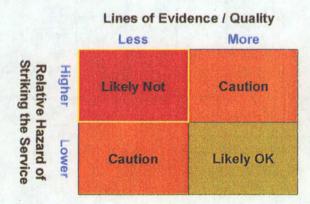
What follows is an illustration of the decision making process, based on the situation presented in the Example Project.

Waiver Decision: Private Markouts

The SSC Information Summary suggests that the team has two of four possible lines of evidence in hand (a site plan and Public Utility markouts). The Site Services Model suggests that while those lines of evidence have provided us with a good idea about the locations and status of some high-hazard services and the former process sewer, they have not provided any sufficient detail about the hydrogen pipeline, which is known to be active and suspected to be running through the work area. That is, we have zero lines of evidence concerning the route of the hydrogen pipeline.

The Private Utility markout is the only available option for obtaining a line of evidence on the hydrogen pipeline. While that provider is on site, they may also be utilized to verify the route of the process sewer (as a second line of evidence) and the status of the de-energized conductors (i.e., that they are indeed de-energized). Additional lines of evidence never hurt!

The Private Utility Markout Waiver Decision



To continue the example, the PIC was not reasonably assured that it would be safe to waive the Private Utility markout and thus decided not to grant the Waiver.

For purposes of the example, assume that the Private Utility markout was used to:

- Verify the route of the process sewer (which was found to align well with available surface clues and the site plan),
- · Confirm that the electrical conductors are indeed de-energized, and
- Identify the route of the hydrogen pipeline (which was found to be distant from the process sewer).

Waiver Decision: Allowing Ground Disturbance within a Critical Zone

Recall from Section 3.3 (item 3.d.ii) that in addition to being "reasonably assured" about the safety of advancing within a Critical Zone, PICs are also required to factor the following into their decisions:

- If possible, energized pipes or cables within the Critical Zone should be de-energized via a formal Lockout/Tagout program.
- Ground Disturbance Activities within the Critical Zone do not present an unacceptable safety, environmental, or operational risk, either on-site or off-site.

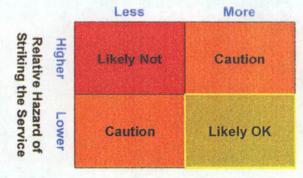
In this case, with the process sewer, there is no need to de-energize it (it is inactive). If the sewer were to be struck, however, there is certainly an environmental risk – but there is some question as to it being an "unacceptable" risk. For the time being, assume that the PIC and project team believe the risk to not be "unacceptable".

Even though the first position, of course, is to not advance within the Critical Zone unless absolutely necessary, the conditions of the Example Project engagement will tend to force the team to advance within the Critical Zone (i.e., close to the lines). Taking that into consideration, the PIC reviews the SSC Information Summary and the Site Services Model – both of which have evolved with the execution of the Private locator service. The PIC, SSC Experienced Person and project team ask, "Given what we know, are we reasonably assured that we will not strike the sewer line?"

By virtue of the Private Utility markout, the team now has an additional line of evidence about the route of the former process sewer and a high degree of confidence in it. The process sewer is not energized and is on the lower end of the relative hazard scale.

The Critical Zone Waiver Decision

Lines of Evidence / Quality



All things being equal, the PIC is reasonably assured that advancing within the Critical Zone would be a safe decision, and will allow the work inside the Critical Zone to proceed.

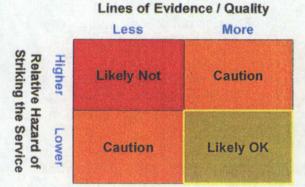
Waiver Decision: Physical Clearance

Recall that there is widespread subsurface debris at the site, mostly present in the 0-1m interval. Ground disturbance will occur inside a Critical Zone, which requires Physical Clearance to the deeper of:

- 7 feet / 2.1 meters;
- 2 feet / 0.6 meters below the frost line; or
- 20% past the expected invert elevation of the service (in this case, up to 2.4m given the depth of the process sewer);

In this example, the "20%" depth controls. Given the logistical and technical challenges, should the PIC allow Physical Clearance to be waived?

The Physical Clearance Waiver Decision



There are multiple, good quality lines of evidence that confirm the routes of nearby services (as well as the absence of others), and the former process sewer ranks low in terms of relative hazard. In this case, the PIC is reasonably assured that waiving the Physical Clearance requirement is a safe decision.

Another Case to Consider

In the example above, circumstances led to fairly clear-cut decisions for granting Waivers to the SSC Process. Considerations of the lines of evidence and relative hazard tended to the regions of "likely not" and "likely OK" in the Wavier Matrix. Real world circumstances may lead to less clear-cut decisions and more ambiguity in being reasonably assured.

As an illustration, replace the former process sewer in the example above with an energized high voltage electrical cable. For the project, it is required to sample within 1 m of the cable. Assume that the Private Utility markout was performed, and that the route of the cable determined from that work matches well with what is shown on the site plan. Should the PIC allow advancing within the Critical Zone?

The High Voltage Cable Critical Zone Waiver Decision

Lines of Evidence / Quality Less More Higher Striking the Service Relative Hazard of Likely Not Caution Caution Likely OK

There are several quality lines of evidence that provide the route and location of the high voltage cable. Striking the cable would indeed be very hazardous. The Waiver Matrix indicates approaching the Waiver decision cautiously. Indeed, that is exactly what the PIC should do.

If the cable can be de-energized through a formal Lock Out / Tag Out program to eliminate the hazard, then a Waiver to advance inside the Critical Zone would be a safe decision.

But what if local utility says that the cable cannot be de-energized? The project requires advancing borings inside a Critical Zone. Even though the team believes that they have a very good understanding of the location of the service, the potential magnitude of the hazard is high, and presents a level of risk that would likely be unacceptable. In this case, not allowing the disturbance within the Critical Zone (i.e., not granting the Waiver) is the safe decision.

Additional considerations may be taken into account here. For example:

- Would it be possible (after discussion with the Client and discussing the risks) to advance farther away from the service (i.e., is it really necessary to get within 1m from the service)?
- Might another discussion with the utility be useful in terms of de-energizing the high voltage cable?
- Are there any additional safety precautions (e.g., grounding the drilling equipment) that might reduce the relative hazard?

Final Notes

Some Waiver decisions may affect other Waiver Decisions. For example, waiving the Private Utility markout eliminates a potential high-quality line of evidence. Not having this line of evidence may affect the ability to be reasonably assured that permitting work within a Critical Zone or waiving the Physical Clearance is a safe decision. Some illustrative guidance was presented above.

In the end, the PIC should err on the side of caution when it comes to taking any Waiver decision. PICs must ultimately be "reasonably assured" that a Waiver decision is a safe one for his / her project team, subcontractors and Client.

Appendix C (Optional Process Component) Field Training Course Outline

APPENDIX C Field Training Course Outline (Optional Process Component)

Subsurface Clearance (SSC) Field Training is an OPTIONAL supplement to the ERM Subsurface Clearance 2.0 Classroom Training and Mentoring. ERM Businesses may elect, at their discretion, to make SSC Field Training a requirement for employees engaged in intrusive work activities.

This Section outlines a Field Training course, which is designed to provide employees an opportunity for practical use of the SSC Process and a clearer understanding of:

- The level of importance that ERM places on our SSC Process;
- The role that historical information plays in the SSC Process;
- The role that processing "Surface Clues" and other information in real time plays in the SSC Process;
- The field use of SSC Process tools; and
- The potential consequences of deviating from the SSC Process.

Material & Equipment Requirements

For each participant:

- Safety Glasses
- High Visibility Vest or Shirt
- Sturdy Work Shoes/Boots
- Site Drawing or Aerial Photograph of Site
- ERM SSC 2.0 Process Flowchart (for reference)
- ERM SSC Checklist & Disturbance Permit (several copies)

For the class session:

Cable Avoidance Tools (assuming available equipment and trained staff)

Outline Design & Execution

- 1. A Subsurface Clearance Experienced Person, as defined in the ERM SSC Procedure, must lead the Field Training.
- 2. A Field Location will be indentified for the training. This may be a project site or a location proximal to an ERM Office.
- 3. The training will be conducted around a "fictitious project" created for purposes of this course. The "site" will be the selected Field Location.
- 4. For the fictitious project:

- a. Develop a "project back story " (e.g., an M&A Phase II to support a property transaction)
- b. Develop a "scope of work" for the project (e.g., 10 geoprobe borings to 6 meters)
- c. Provide site maps, drawings, or at a minimum, an aerial photograph of the Field Location.
- 5. Before going to the field, ask participants to prepare their own Level 2 Intrusive Work WARN Health & Safety Plan (HASP), including the SSC Information Summary and Site Services Model. This may be structured as a group exercise among smaller numbers of participants if so desired.
- 6. Start the Field Training Course with a "Toolbox Safety Discussion" and making all participants sign a training Sign-In Sheet.
- 7. Review surface clues at the site that may indicate subsurface obstructions and utilities.
- 8. Conduct an exercise that incorporates the "gaps" identified in Site Services Model.
 - a. Emphasis should be placed on recognizing how the availability of information (or lack thereof) plays a role in the adequate preparation to safely conduct ground disturbance activities.
 - b. Participants might be asked if they would be comfortable commencing ground disturbance with the resources available.
- 9. Identify several hypothetical borehole (Point Disturbance) locations and one mass excavation location. Hypothetical locations should be chosen so that the following scenarios can be emphasized
 - a. Work within a critical zone;
 - b. Work beneath overhead obstructions or power lines; and
 - c. Work in the anticipated path of subsurface utility lines (i.e., between an electrical substation and building electrical supply).
- Enable the use of a Cable Avoidance Tool at the Field Location. Use it to help close gaps in the Site Services Model.
- 11. A SSC Checklist & Disturbance Permit should be completed for each hypothetical ground disturbance location. Emphasis should be placed on the following aspects:
 - a. Critical Zone Determination and clearance depth requirements. ERM's default position NOT TO ADVANCE in a Critical Zone should be discussed with emphasis on implications to safety and to the client.
 - b. Physical Clearance at the location what must happen if requirement is waived by the PIC?

- Signature requirements with focus on refusal to sign or verbal approval only by the Client Contact
- d. Critical Zone Determination Sketch require sketches to be drawn for each of the hypothetical ground disturbance locations and consider reviewing each sketch as a group exercise highlighting positives and opportunities for improvement.
- 12. Hypothetical scenarios should be discussed in which a Subsurface Obstruction is contacted and the required actions as a result:
 - a. A worker injury;
 - b. A damage to useful property;
 - c. A near miss (for example, the strike of a concrete subsurface structure causing no damage)
 - d. An unsafe act; and
 - e. An unsafe condition.
- 13. Consider a group discussion regarding UXO/MEC and what actions should be taken when UXO are uncovered on a project site. Emphasis should be placed on discussing the three R's Recognize, Retreat, and Report.
- 14. Using the Sign-In Sheet, a member of the Local Safety Team will add the completion of the SSC Field Training Course to each participating employee's safety training database record.

Appendix E

12 November 2010 Project No. 0042525 North Penn Area 2 Superfund Site Hatfield Township, Pennsylvania



Project Name:		•	
Project Number:			
Inspector/Project Role:			
Date/Time:		-	
,			

	Document Routing	
FSO	Retain copy in site health & safety file, amend to HASP as necessary.	

Instructions:

Complete the checklist below. Record any observed Unsafe Acts or Unsafe Conditions using a separate form for each. For additional comments use the back of these pages. Start all comments by identify applicable section for reference.

Personnel Administrative

Observation	Yes	No	N/A	Comments
Did all site workers attend site orientation and HASP?				
Are workers attending and signing daily toolbox safety meeting?				
Are workers reporting unsafe acts and conditions?				

Site

Observation	Yes	No	N/A	Comments
Are MSDS'S available for each chemical at the site?				
Are flammable liquids stored away from ignition sources and in a secure place when not in use?				
Are spill kits readily available?				
Are fire extinguishers inspections current and strategically located?			:	
Are adequate hygiene facilities available for site workers?				
Have smoking and eating areas been established?				
Are JHAs completed and reviewed by workers in accordance with the HASP				
Do workers comply with site speed limits and traffic rules?				
Do workers comply with site cell phone policy?				

Housekeeping

Observation	Yes	No	N/A	Comments	
Is site kept clean, neat and orderly?					
•	ļ				



Project Name:		•		
Project Number:				
Inspector/Project Role:				
Date/Time:				

Are worker hygiene facilities, toilets, hand-wash stations, lunch area maintained and adequately stocked?					• .
Are warning signs legible?			·		;
Are tools properly stored?	·			·	
Is trash picked up regularly and properly disposed?					
Is used PPE properly disposed?			·		
Are all containers properly labeled?					
Is there accumulated snow or ice over footpaths or roadways?		. •		· · · · · · · · · · · · · · · · · · ·	

Emergency Preparedness

Observation	Yes	No	N/A	Comments
Have workers been informed of the site emergency response procedures?				
Do workers know the nearest assembly point for their work area?				
Do workers know the location/s of the nearest eyewash/shower?				
Do workers know the location of the nearest first-aid kit				
Is there at least one first aid trained person on site at all times?				
Do workers know how to report an emergency?				
Do workers know the type of alarm used to identify an emergency or evacuation at the site?				
Has a site emergency evacuation drill been conducted?				



Project Name:				
Project Number:	•			•
Inspector/Project Role:		•	,	
Date/Time:				

Work Zones

Observation	Yes	No	N/A	Comments
Are exclusion, decontamination and safe zones clearly identified and maintained?				
Are workers following proper decontamination procedures?				
Is equipment decontamination procedures followed?				
Is the decontamination station adequately stocked?		-	-	
Is the "Buddy System" adhered to?				

Ambient Work Conditions

Observation	Yes	No	N/A	Comments
Is sufficient lighting available to safely do the work?	,			
If the temperature is above 85 F (29 C), are there liquids available such as Gatorade / water?	·			
Is there proper ventilation at the job site?				

General PPE Matters

Observation	Yes	No	N/A	Comments
Are hardhats being worn?				
Are workers utilizing appropriate eye protection for the?			,	
Are workers utilizing the appropriate foot protection for the task?				
Is hearing protection required and utilized?				
Are workers using and wearing the appropriate hand protection for the task?				



Project Name:					
Project Number:	•		,	1	
Inspector/Project Role:	•	•		•	
Date/Time:					
,					

Hand and Foot Protection

Observation	Yes	No	N/A	Comments
Are the appropriate gloves being worn by site workers as identified by the HASP or JHA?				
Is the appropriate footwear worn by site workers as identified by the HASP or JHA?				
Are disposable gloves and footwear disposed of properly?				

Respiratory Protection

Observation	Yes	No	N/A	Comments
Are copies of employee respiratory training records, fit test and fit to work statements current and available on site?				
Are workers following respirator cartridge change out schedule?				
Are workers following proper respirator donning procedures?				
Are respirators cleaned and stored properly when not in use?				

Condition of Protective Clothing

Observation	Yes	No	N/A	Comments
Is protective clothing worn by workers in good condition? (no rips or tears)				
Is the type of protective clothing selected appropriate for the task? (see HASP or JHA'S)	,			
Are workers correctly wearing the protective clothing? (e.g., Zippers zipped, proper taping of sleeves)		,		
Is contaminated clothing properly disposed?				



Project Name:	
Project Number:	
Inspector/Project Role:	
Date/Time:	·

Ground Disturbance and Excavations

Observation	Yes	No	N/A	Comments
Has the sub-surface checklist been completed and signed off by all appropriate parties?				
Are all sub-surface processes or utility lines clearly identified?				
Is there at least one competent excavation person on site at all times?				
Is a copy of the competent excavation person training records available for review?				
Are excavations properly sloped shored or benched?				
Are excavations properly protected by hard or soft barricade?			•	

Hand and Powered Hand Tools

Hand and Powered Hand Tools					
Observation	Yes	No	N/A	Comments	
Are all hand tools in good working order and appropriate for the task?					
Are electrical cords in good repair and inspected prior to use?					
Are external GFCI'S used and routinely inspected?					
Are guards and other safety devises present and in good working order?					
Are workers wearing hearing protection when using high noise producing tools?					
Are workers wearing appropriate PPE when using electrical or pneumatic tools?					
Are pneumatic hoses in good condition?					
Is/are fire extinguishers located nearby portable compressors or generators?					
Are generators or compressors shut down prior to fueling?					
Are malfunctioning tools tagged and taken out of service?					



Project Name:	-	·	· · · · · · · · · · · · · · · · · · ·	
Project Number:				
Inspector/Project Role:		•		
Date/Time:				

Heavy Equipment

Observation	V	NI_	DI/A	Comments
Observation	Yes	No	N/A	Comments
Are daily equipment inspection checklists completed?				
Are safety deficiencies immediately repaired or has the equipment been taken out of service?				
Do the back-up alarms work?				
Does the operator use three-points of contact when getting on/off equipment?				
Is heavy equipment operated within its design capacity?				·
Is equipment operated at safe speeds for site conditions?				
Are fire extinguishers present and in good working order on all equipment?				
Are keys or control panels removed when equipment is not in use?				
Are workers working with or near heavy equipment operations wearing high visibility clothing (i.e. traffic vest?	·			

Reserved

Appendix F

12 November 2010 Project No. 0042525 North Penn Area 2 Superfund Site Hatfield Township, Pennsylvania

Work Permit Forms

Appendix G

12 November-2010 Project No. 0042525 North Penn Area 2 Superfund Site Hatfield Township, Pennsylvania

SAFE WORK PERMIT

SAFE WOR	K PERMIT
☐ Confined Space Entry ☐ Hot Work	Line Breaking
Location:	WO Number ERM
Scope of Work:	EXIV
Issued To:	Issued By:
Date & Time Issued	Date & Time Expires
Section I General Information (Complete for all permits)	
Job Specific Hazards	
☐ Worksite Chemicals ☐ Atmospheric Hazards	☐ Thermal Burns ☐ Chemical Burns
☐ Corrosives ☐ Flammable Liquids	☐ Reactive Liquids ☐ Toxic Substances
☐ Ignition Sources ☐ Electrical Hazards	☐ Electrical Cords ☐ Falls above 4'
Steam Vehicle Traffic	Adjacent Work Heat Stress/Cold Injuries
High Pressure Radiation	☐ Noise ☐ Pinch Points
Other	
2. PPE/Equipment	
Inner Gloves Half-faced Respirator	☐ Welding Shield ☐ Tripod w/ lifting device
Outer Gloves Full-Faced Respirator	Spark Proof Tools Harness
☐ Chemical Suit ☐ Line Air Respirator ☐ Poly Coated Suit ☐ SCBA	☐ Fire Extinguisher(s) ☐ Ventilation ☐ Decon Materials ☐ Work lights
Hearing Protection Chemical Goggles	First Aid Kit GFCI
Safety Shoes/Boots Face Shield	Eyewash Station Two-way Radio
Safety Glasses w/ Hard Hat	Spill Response Barricades/Warning
Side Shield	Equipment Signals
Other	Equipment 5.8
3. Rescue and Emergency Services Service Name: Telephone Number:	ntact Name:
Section II Confined Space Entry	
Space to be Entered:	
2. Purpose of Entry:	·
3. Describe how the hazards identified in Section I have been	addresses/isolated:
	<u> </u>
	
A Durity Commission Provides to 1	A Manual and Administration of the Control of the C
4. Describe Communication Procedures used by Entrant and	Attendant during entry:
	
Section III Hot Work	
Equipment to be worked on:	The state of the s
2. Precautions:	
	openings covered
	uishers at location
	posted (> 30 min) Adequate ventilation
	· · · · · · · · · · · · · · · · · · ·
3. Name of Fire Watch: Fire watch star	t time: Fire watch end time:

Section IV Line Breaking	A BANKAWA TALAH BA	1. 高层的 1. Mar 16 1 1 1	
1. Line/Equipment positively identified?		Yes	□ NA
2. Line/Equipment properly drained/depress	urized/purged/blanked		□ NA
3. Line/Equipment cleaned of residual mater	rial?	Yes	□ NA
4. Bonding and grounding required?	,	Yes	□ NA
5. Non-sparking tools required?		☐ Yes	□ NA
6. Atmospheric monitoring required?		Yes	□ NA
7. Containment/spill control required?		Yes	□ NA
7. Communication of required:			LI NA
	······································		
Section V Atmospheric Monitoring (Comp	lete for Confined Space	e Entry and Hot Work	
Parameters Initial		Periodic Periodic	
Results	Results Results	· "	Results Results Results
Time Monitored	Acaulta Acaulta	ixesuits ixesuits	Results Results
1	·	: 	· · · · · · · · · · · · · · · · · · ·
Tester's Initials/Signature			
Oxygen (19.5%-23.5%)	j		
Flammability (< 10% LEL)			
Other			
Other	<u> </u>		
	,		
Section VI Personnel Accountability (Comp			
Issuing Supervisor	Signature:	<u> </u>	Time:
H&S Lead	Signature:	· · · · · · · · · · · · · · · · · · ·	Time:
Entrant	Signature:		Time:
Entrant	Signature:		Time:
Entrant	Signature:		Time:
Attendant	Signature:		Time:
Attendant	Signature:		Time:
Attendant	Signature:	*****	
Fmnlovee	Signature:		Time:
Employee	Signature:		Time:
Employee	Signature:		Time:
Employee			
Employee	Signature:		Time:
<u> </u>	n n	****	
Section VII Special Instructions (Complete a	s necessary)	and the state of the state of	
	<u> </u>	The state of the s	
			
			. <u> </u>
Section VIII Contractors (Complete as necess	ary)		
The following aspects of the permitted wo		discussed and coordin	ated with the contractor
1. Roles and Responsibilities	Yes	□ No □	NA
2. Job Specific Hazards	Yes	□ No □] NA
3. PPE Requirements	☐ Yes	□ No □	NA
4. Rescue Activities and Emergency Respon			NA
Resource restricted and Emergency Respons	<u> </u>		
Section IX Canceling the Permit (Complete	for all permits)		
1. Has the job, defined in the scope above be			lo 🗌 NA
2. Have affected personnel been informed the		= =	lo NA
3. Has equipment been returned to service?	o jou is complete?	= =	
		= =	lo U NA
4. Have safety devices been reinstalled?	haan add 10	= =	lo UNA
5. Have housekeeping/environmental issues	been addressed?	☐ Yes ☐ N	lo 🗌 NA
Closeout Signature:	Time:	Date:	
•			i

Universal Chemical Safety Data Cards

Appendix H

12 November 2010 Project No. 0042525 North Penn Area 2 Superfund Site Hatfield Township, Pennsylvania

International Chemical Safety Cards

ARSENIC

ICSC: 0013











Grey arsenic As Atomic mass: 74.9

ICSC# 0013

CAS# 7440-38-2

UN# 1558

EC # 033-001-00-X May 04, 2010 Validated

Personal protection: chemical

spilled substance into sealable

protection suit including self-contained

chemical enter the environment. Sweep

containers. Carefully collect remainder,

breathing apparatus. Do NOT let this

Fa, rack corrections: 10-2004, Sankt Augustin;



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS		PREVENTION		FIRST AID/ FIRE FIGHTING
FIRE			NO open flames. NO conta with strong oxidizers. NO contact with hot surfaces.	ct	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Risk of fire and explosion on contact with : see Chemical Dangers.		No contact with incompatib materials: see Chemical dar		
EXPOSURE			PREVENT DISPERSION (DUST! A VOID ALL CONTACT!	OF	
•INHALATION	see Ingestion.		Closed system and ventilati	on.	Fresh air, rest. Seek medical attention if you feel unwell.
•skin			Protective gloves. Protectiv clothing.	e	Remove contaminated clothes, Rinse and then wash skin with water and soap.
•EYES			Face shield or eye protection combination with breathing protection if powder.		Rinse with plenty of water (remove contact lenses if easily possible).
•INGESTION	Abdominal pain. Dian Nausea. Vomiting. W Shock or collapse. Unconsciousness.		Do not eat, drink, or smoke during work. Wash hands before eating.		Rinse mouth. Refer immediately for medical attention.
SPILLAGE DISPOSAL		STORAGE		PACKAGING & LABELLING	

Separated from strong oxidants, acids,

halogens, food and feedstuffs. Well

from fire extinguishing. Store in an

area without drain or sewer access.

closed. Provision to contain effluent

Do not transport with food and

S: 1/2-20/21-28-45-60-61

feedstuffs.

T symbol N symbol

R: 23/25-50/53

ICSC: 0013

then remove to safe place.		UN Hazard Class: 6.1 UN Packing Group: II Signal: Danger Skull-Health haz Toxic if swallowed May cause cancer Suspected of damaging fertility or the unborn child Causes damage to the gastrointestinal tract if swallowed Causes damage to organs through prolonged or repeated exposure Toxic to aquatic life May cause long lasting harmful effects to aquatic life	
ICSC: 0013 SEE IMPORTANT INFORMATION ON BACK Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.			

International Chemical Safety Cards

AKSENIC		
ı	PHYSICAL STATE; APPEARANCE: BRITTLE, GREY, METALLIC-LOOKING CRYSTALS.	ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.
М	PHYSICAL DANGERS:	INHALATION RISK: A harmful concentration of airborne particles
P	CHEMICAL DANGERS:	can be reached quickly when dispersed, especially, if powdered.
O	Upon heating, toxic fumes are formed. Reacts	
R	violently with strong oxidants and halogens, causing fire and explosion hazard. Reacts with	EFFECTS OF SHORT-TERM EXPOSURE: The substance may cause effects on the
T	reducing agents to produce toxic and flammable arsine gas (See ICSC 0222).	gastroenteritis, loss of fluid, and electrolytes,
A	OCCUPATIONAL EXPOSURE LIMITS:	cardiac disorders, shock and convulsions. Exposure far above the OEL may result in
N	OSHA PEL: 1910.1018 TWA 0.010 mg/m ³ NIOSH REL: Ca C 0.002 mg/m ³ 15-minute <u>See</u>	death. The effects may be delayed. Medical
т	Appendix Λ NIOSH IDLH: Ca 5 mg/m ³ (as As) See: 7440382	EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
D	TLV: 0.01 mg/m³ as TWA; A1 (confirmed human carcinogen); BEI issued; (ACGIH	The substance may have effects on the skin, mucous membranes, peripheral nervous
A .	2010). MAK:	system . liver and bone marrow , resulting in pigmentation disorders, hyperkeratosis, perforation of nasal septum, neuropathy,
Т	Carcinogen category: 1; Germ cell mutagen group: 3A;	anaemia, liver impairment. This substance is carcinogenic to humans. Animal tests show that
A	(DFG 2009).	this substance possibly causes toxicity to human reproduction or development.
PHYSICAL PROPERTIES	Sublimation point: 613°C Density: 5.7	Solubility in water: none

ARSENIC

g/cm³ Auto-ignition temperature: 180°C The substance is toxic to aquatic organisms. It is strongly advised that this substance ENVIRONMENTAL does not enter the environment. DATA NOTES The substance is combustible but no flash point is available in literature. Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home. ADDITIONAL INFORMATION ICSC: 0013 **ARSENIC** (C) IPCS, CEC, 1994

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CADMIUM

ICSC: 0020











Cd

Atomic mass: 112.4

ICSC # 0020

CAS# 7440-43-9

RTECS # EU9800000

UN# 2570

EC # 048-002-00-0

April 22, 2005 Validated



April 22, 2005 Validated						
TYPES OF HAZARD/ EXPOSURE	ACUTE HAZ SYMPTO		PREVENTION		FIRST AID/ FIRE FIGHTING	
FIRE	Flammable in powder form and spontaneously combustible in pyrophoric form. Gives off irritating or toxic fumes (or gases) in a fire.		NO open flames, NO sparks, and NO smoking. NO contact with heat or acid(s).		Dry sand. Special powder. NO other agents.	
EXPLOSION	OSION Finely dispersed particles form explosive mixtures in air.		Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.			
EXPOSURE			PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!		IN ALL CASES CONSULT A DOCTOR!	
•INHALATION	Cough. Sore throat.		Local exhaust or breathing protection.		Fresh air, rest. Refer for medical attention.	
•SKIN			Protective gloves.		Remove contaminated clothes. Rinse and then wash skin with water and soap.	
•EYES	Redness. Pain.		Safety goggles or eye prote in combination with breath protection.	ction ing	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.	
•INGESTION	Abdominal pain. Dia Headache. Nausea. V		Do not eat, drink, or smoke during work.		Rest. Refer for medical attention.	
SPILLAGE DISPOSAL			STORAGE		PACKAGING & LABELLING	
protection: chemical protection suit		Separated fr	rated from igntion sources, breaks ants acids, food and feedstuffs . unbreak		rtight. Unbreakable packaging; put eakable packaging into closed breakable container. Do not transport th food and feedstuffs. bte: E	

containers. Carefully collect remainder, T+ symbol N symbol then remove to safe place. R: 45-26-48/23/25-62-63-68-50/53 S: 53-45-60-61 UN Hazard Class: 6.1

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0020

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International Chemical Safety Cards

CADMIUM ICSC: 0020

	PHYSICAL STATE; APPEARANCE: SOFT BLUE-WHITE METAL LUMPS OR GREY POWDER. MALLEABLE. TURNS BRITTLE ON EXPOSURE TO 80°C AND TARNISHES ON EXPOSURE TO MOIST	ROUTES OF EXPOSURE: The substance can be absorbed into the body be inhalation of its aerosol and by ingestion. INHALATION RISK:
1	AIR. PHYSICAL DANGERS:	A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.
M	Dust explosion possible if in powder or granular form, mixed with air.	EFFECTS OF SHORT-TERM EXPOSURI
P	CHEMICAL DANGERS:	The fume is irritating to the respiratory tract. Inhalation of fume may cause lung oedema (see
O	Reacts with acids forming flammable/explosive gas (hydrogen - see ICSC0001). Dust reacts	Notes). Inhalation of fumes may cause metal fume fever. The effects may be delayed.
R.	with oxidants, hydrogen azide, zinc, selenium	Medical observation is indicated.
Т	or tellurium, causing fire and explosion hazard.	EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
A	OCCUPATIONAL EXPOSURE LIMITS: TLV: (Total dust) 0.01 mg/m³;	Lungs may be affected by repeated or prolonged exposure to dust particles. The
N ·	(Respirable fraction)	substance may have effects on the kidneys,
T	0.002 mg/m³; as TWA; A2 (suspected human carcinogen); BEI issued; (ACGIH 2005). MAK: skin absorption (H);	resulting in kidney impairment. This substance is carcinogenic to humans.
D	Carcinogen category: 1; Germ cell mutagen group: 3A; (DFG 2004).	
A	OSHA PEL*: 1910.1027 TWA 0.005 mg/m ³	
T	*Note: The PEL applies to all Cadmium compounds (as Cd).	
Α -	NIOSH REL*: Ca See Appendix A *Note: The REL applies to all Cadmium compounds (as	
	Cd). NIOSH IDLH: Ca 9 mg/m ³ (as Cd) See: <u>IDLH</u>	
	INDEX	
PHYSICAL	Boiling point: 765°C Melting point: 321°C	Solubility in water: none Auto-ignition temperature: (cadmium metal

ENVIRONMENTAL DATA

NOTES

Reacts violently with fire extinguishing agents such as water, foam, carbon dioxideand halons. Depending on the degree of exposure, periodic medical examination is indicated. The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Do NOT take working clothes home. Cadmium also exists in a pyrophoric form (EC No. 048-011-00-X), which bears the additional EU labelling symbol F, R phrase 17, and S phrases 7/8 and 43. UN numbers and packing group will vary according to the physical form of the substance.

ADDITIONAL INFORMATION

ICSC: 0020

CADMIUM

(C) IPCS, CEC, 1994

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CHROMIUM

ICSC: 0029











Chrome Cr Atomic mass: 52.0 (powder)

ICSC # 0029 CAS # 7440-47-3 RTECS # <u>GB4200000</u> October 27, 2004 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS		PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE			No open flames if in powder form.	In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			Prevent deposition of dust; closed system, dust explosion- proof electrical equipment and lighting.	
EXPOSURE			PREVENT DISPERSION OF DUST!	
·INHALATION	Cough.		Local exhaust or breathing protection.	Fresh air, rest.
•skin	Redness.		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
•EYES			Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION			Do not eat, drink, or smoke during work.	Rinse mouth.
SPILLAGE	SPILLAGE DISPOSAL		STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Personal protection: P2 filter respirator for harmful particles.				
	SEE IM	1PORTAN	IT INFORMATION ON BAC	'K
Prepared in the context of cooperation between the International Programme on Chemical Safety & the				

ICSC: 0029

Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

CHROMIUM

ICSC: 0029

1	PHYSICAL STATE; APPEARANCE: GREY POWDER	ROUTES OF EXPOSURE:					
• м	PHYSICAL DANGERS:	INHALATION RISK:					
P	Dust explosion possible if in powder or granular form, mixed with air.	A harmful concentration of airborne particles can be reached quickly when dispersed.					
O	CHEMICAL DANGERS:	EFFECTS OF SHORT-TERM EXPOSURE:					
R	Chromium is a catalytic substance and may cause reaction in contact with many organic	May cause mechanical irritation to the eyesandthe respiratory tract.					
Т	and inorganic substances, causing fire and explosion hazard.	EFFECTS OF LONG-TERM OR					
A	OCCUPATIONAL EXPOSURE LIMITS: TLV: (as Cr metal, Cr(III) compounds) 0.5	REPEATED EXPOSURE:					
N	mg/m³ as TWA; A4; (ACGIH 2004). MAK not established.						
T	OSHA PEL*: TWA 1 mg/m ³ Sec Appendix C *Note: The PEL also applies to insoluble						
D .	chromium salts. NIOSH REL: TWA 0.5 mg/m ³ See Appendix C						
Α		<u>.</u>					
Т	NIOSH IDLH: 250 mg/m ³ (as Cr) See: 7440473						
A							
PHYSICAL PROPERTIES	Boiling point: 2642°C Melting point: 1900°C Density: 7.15 g/cm³.	Solubility in water: none					
ENVIRONMENTAL DATA							
· .	NOTES						
The surface of the chron	mium particles is oxidized to chromium(III)oxide	e in air. See ICSC 1531 Chromium(III) oxide.					
	ADDITIONAL INFORMA	TION					
ICSC: 0029	(C) IPCS, CEC, 1994	CHROMIUM					

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U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

1,4-DIOXANE

ICSC: 0041











1,4-Diethylene dioxide Dioxane para-Dioxane $C_4H_8O_2$ Molecular mass: 88.1

ICSC# 0041 CAS# 123-91-1 RTECS # JG8225000 UN# 1165

EC# 603-024-00-5

November 11, 2008 Validated

Pu, hed in Series 1.



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING	
FIRE	Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks, and NO smoking. NO contact with strong oxidants. NO contact with hot surfaces.	Powder, alcohol-resistant foam, water spray, carbon dioxide water may be ineffective: water spray: OK;	
EXPLOSION Vapour/air mixtures are explosive. Risk of fire and explosion on contact with incompatible materials: see Chemical Dangers.		Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	In case of fire: keep drums, etc., cool by spraying with water.	
EXPOSURE		PREVENT GENERATION OF MISTS!		
•INHALATION	Cough. Sore throat. Nausea. Dizziness. Headache. Drowsiness. Vomiting. Unconsciousness. Abdominal pain.	Ventilation (not if powder), local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention immediately.	
•skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.	
•EYES	Redness. Pain. es watering of the eyes. at update 2007 due to eye irritation;	Face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible).	
		Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Seek medical attention	

·INGESTION		if you feel unwell om Refer for medical attention. at update 2007.;		
SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING		
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking liquid in sealable air tight containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. m Collect leaking and spilled liquid in sealable containers as far as possible. at update 2007;		Airtight. Note: D F symbol Xn symbol R: 11-19-36/37-40-66 S: 2-9-16-36/37-46 UN Hazard Class: 3 UN Packing Group: Il Signal: Danger Flame-Excl mark-Health haz Highly flammable liquid and vapour Causes eye irritation May cause respiratory irritation Suspected of causing cancer May be harmful if swallowed and enters airways		
SEE	IMPORTANT INFORMATION ON B	ACK		
Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.				

1,4-DIOX	ANE	ICSC: 0041		
	PHYSICAL STATE; APPEARANCE: COLOURLESS LIQUID, WITH	ROUTES OF EXPOSURE: The substance can be absorbed into the body by		
	CHARACTERISTIC ODOUR.	inhalation of its vapour and through the skin.		
·	PHYSICAL DANGERS:	INHALATION RISK:		
I	The vapour is heavier than air and may travel along the ground; distant ignition possible.	A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C; on spraying or dispersing,		
M	CHEMICAL DANGERS: The substance can form explosive peroxides on	however, much faster. m free phrase of 'on		
P	contact with air. Reacts with oxidants and			
О	strong acids. Reacts violently with some catalysts. hanged from Reacts vigorously with strong oxidants and concentrated strong acids.	The substance is irritating to the eyes and the		
R	at update 2007; Replace from Reacts explosively with some catalysts (e.g., Raney-	respiratory tract . If swallowed the substance may cause vomiting, and could result in		
Т .	nickel above 210°C). at update 2007; acks many plastics. at update 2007 due to no info;	aspiration pneumonitis. Exposure at high levels could cause lowering of consciousness. 46; m Exposure to high vapour concentrations may		
A	OCCUPATIONAL EXPOSURE LIMITS:	result in unconsciousness. at update 2007.;		
N	TLV: 20 ppm as TWA; (skin) A3 (confirmed animal carcinogen with unknown relevance to	EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:		
Т	humans); (ACGIH 2008). MAK: 20 ppm, 73 mg/m³; Peak limitation category: I(2);	The liquid defats the skin. The substance may have effects on the central nervous system,		
D	r cak miniation category. I(2);	kidneys, and liver. This substance is possibly		

	A	skin absorption (H); Carcinogen category: 4; Pregnancy risk group:	carcinogenic to humans. p 2B), Changed from This substance is probably carcinogenic to
	Т	C; (DFG 2008).	humans. at update 2007.
	A	OSHA PEL†: TWA 100 ppm (360 mg/m³) skin	
	·	NIOSH REL: Ca C 1 ppm (3.6 mg/m³) 30- minute <u>See Appendix A</u> NIOSH IDLH: Ca 500 ppm See: <u>123911</u>	
	PHYSICAL PROPERTIES	Boiling point: 101°C Melting point: 12°C Relative density (water = 1): 1.03 Solubility in water: miscible Vapour pressure, kPa at 20°C: 3.9 Relative vapour density (air = 1): 3.0	Relative density of the vapour/air-mixture at 20°C (air = 1): 1.08 Flash point: 12°C c.c. Auto-ignition temperature: 180°C Explosive limits, vol% in air: 2.0-22.0 Octanol/water partition coefficient as log Pow: -0.27 Viscosity, mm2/s at 25 °C: 1.17
	ENVIRONMENTAL DATA		
li			

NOTES

Check for peroxides prior to distillation; eliminate if found. Refer for medical attention if breathing difficulties and/or fever develop. .83(24ppm from Appendix 6); Other OSF=20/170=0.12(170 ppm at update 2007, i.e., changed from Check for peroxides prior to distillation; render harmless if positive.;

Transport Emergency Card: TEC (R)-30S1165 or 30GF1-I+II

NFPA Code: H2, F3, R1

	ADDITIONAL INFORMATION)N					
			•				
ICSC: 0041			1,4-DIOXANE				
	(C) IPCS, CEC, 1994						

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LEAD

ICSC: 0052











Lead metal Plumbum Pb (powder)

ICSC # 0052 CAS # 7439-92-1 RTECS # <u>OF7525000</u> August 10, 2002 Validated

					
TYPES OF HAZARD/ EXPOSURE	ACUTE HAZ SYMPTO		PREVENTION	FIRST A	
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.			In case of fire in th surroundings: use a extinguishing med	appropriate
EXPLOSION	Finely dispersed particles form explosive mixtures in air.		Prevent deposition of dust; closed system, dust explosi proof electrical equipment a lighting.		
EXPOSÙRE	See EFFECTS OF LONG- TERM OR REPEATED EXPOSURE.		PREVENT DISPERSION (DUST! AVOID EXPOSUR (PREGNANT) WOMEN!		
•INHALATION			Local exhaust or breathing protection.	Fresh air, rest.	
•SKIN			Protective gloves.	Remove contamina Rinse and then was water and soap.	
•EYES		:	Safety spectacles.	First rinse with ple for several minutes contact lenses if ea then take to a doctor	(remove sily possible),
•INGESTION Abdominal pain. Nausea. Vomiting.		usea.	Do not eat, drink, or smoke during work. Wash hands b eating.	Rinse mouth. Give water to drink. Ref	
SPILLAGE DISPOSAL			STORAGE	PACKAGIN LABELLIN	
containers; if appropriate, moisten first			om food and feedstuffs and e materials . See Chemical		

filter respirator for toxic particles.

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0052

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International Chemical Safety Cards

ICSC: 0052 **LEAD**

ENVIRONMENTAL DATA	Bioaccumulation of this chemical may occur in advised that this substance does not enter the en	plants and in mammals. It is strongly vironment.
PHYSICAL PROPERTIES	Boiling point: 1740°C Melting point: 327.5°C	Density: 11.34 g/cm³ Solubility in water: none
	NIOSH IDLH: 100 mg/m ³ (as Pb) See: 7439921	
; A ·	Appendix C *Note: The REL also applies to other lead compounds (as Pb) - see Appendix C.	
T	Appendix C. NIOSH REL*: TWA 0.050 mg/m ³ See	
A .	See Appendix C *Note: The PEL also applies to other lead compounds (as Pb) see	
D	(DFG 2006). EU OEL: as TWA 0.15 mg/m³; (EU 2002). OSHA PEL*: 1910.1025 TWA 0.050 mg/m³	
T	Carcinogen category: 2; Germ cell mutagen group: 3A;	carcinogenic to humans. fast track change Oct 06 - IARC 2A.
N	animal carcinogen with unknown relevance to humans); BEI issued; (ACGIH 2004).	abdominal cramps and kidney impairment. Causes toxicity to human reproduction or development. This substance is probably
A	OCCUPATIONAL EXPOSURE LIMITS: TLV: 0.05 mg/m³ as TWA; A3 (confirmed	resulting in anaemia, encephalopathy (e.g., convulsions), peripheral nerve disease,
R T	and by weak organic acids in the presence of oxygen.	The substance may have effects on the blood, bone marrow, central nervous system, peripheral nervous system and kidneys,
0	nitric acid, boiling concentrated hydrochloric acid and sulfuric acid. Attacked by pure water	EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
P	CHEMICAL DANGERS: On heating, toxic fumes are formed. Reacts with oxidants. Reacts with hot concentrated	EFFECTS OF SHORT-TERM EXPOSURE
i M	Dust explosion possible if in powder or granular form, mixed with air.	can be reached quickly when dispersed, especially if powdered.
	TARNISHED ON EXPOSURE TO AIR. PHYSICAL DANGERS:	INHALATION RISK: A harmful concentration of airborne particles
	PHYSICAL STATE; APPEARANCE: BLUISH-WHITE OR SILVERY-GREY SOLID IN VARIOUS FORMS. TURNS	ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation and by ingestion.

Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home. Card has been partly updated in April 2005. See section Occupational Exposure Limits. Card has been partly updated in October 2006: see section Occupational Exposure Limits, Effects Long Tem Exposure.

		ADDITIONAL	INFORMATION	•		
	· · · · · · · · · · · · · · · · · · ·					
ICSC: 0052					:	LEAD
		(C) IPCS	, CEC, 1994		•.	

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TETRACHLOROETHYLENE

ICSC: 0076











1,1,2,2-Tetrachloroethylene Perchloroethylene Tetrachloroethene C₂Cl₄ / Cl₂C=CCl₂ Molecular mass: 165.8

ICSC # 0076 CAS # 127-18-4 RTECS # <u>KX3850000</u>

UN# 1897

EC# 602-028-00-4

April 13, 2000 Validated



1 tpi ii 13, 2000					
TYPES OF HAZARD/ EXPOSURE	ACUTE HAZ SYMPTO		PREVENTION		FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.				In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION					
EXPOSURE		:	STRICT HYGIENE! PREV GENERATION OF MISTS		
·INHALATION	Dizziness. Drowsiness. Headache. Nausea. Weakness. Unconsciousness.		Ventilation, local exhaust, or breathing protection.		Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
•SKIN	Dry skin. Redness.		Protective gloves. Protective clothing.		Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.		Safety goggles , face shield	٠, ٠,	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. (Fu Inhalation).	on). during work.		Rinse mouth. Do NOT induce vomiting. Give plenty of water to drink. Rest.	
SPILLAGE DISPOSAL		STORAGE		PACKAGING & LABELLING	
liquid in sealable containers as far as Dangers), for		from metals ,(see Chemical food and feedstuffs . Keep . Ventilation along the floor. Do not transport with food and feedstuffs. Marine pollutant. Xn symbol N symbol		tuffs. ne pollutant. mbol	

enter the environment. Personal protection: filter respirator for organic gases and vapours.

R: 40-51/53 S: (2-)23-36/37-61 UN Hazard Class: 6.1 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0076

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

TETRACHLOROETHYLENE

ICSC: 0076

TETRACII	COROETHILENE	
1.	PHYSICAL STATE; APPEARANCE: COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.	ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation and by ingestion.
М	PHYSICAL DANGERS: The vapour is heavier than air.	INHALATION RISK: A harmful contamination of the air will be
P	CHEMICAL DANGERS:	reached rather slowly on evaporation of this substance at 20°C.
О	On contact with hot surfaces or flames this substance decomposes forming toxic and	EFFECTS OF SHORT-TERM EXPOSURE:
R	corrosive fumes (hydrogen chloride, phosgene, chlorine). The substance decomposes slowly on	The substance is irritating to the eyes, the skin
т	contact with moisture producing trichloroacetic acid and hydrochloric acid. Reacts with metals	swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may
A	such as aluminium, lithium, barium, beryllium.	cause effects on the central nervous system. Exposure at high levels may result in
N	OCCUPATIONAL EXPOSURE LIMITS: TLV: 25 ppm as TWA, 100 ppm as STEL; A3	unconsciousness.
т	(confirmed animal carcinogen with unknown relevance to humans); BEI issued; (ACGIH 2004).	EFFECTS OF LONG-TERM OR REPEATED EXPOSURE: Repeated or prolonged contact with skin may
D	MAK: skin absorption (H); Carcinogen category: 3B;	cause dermatitis. The substance may have effects on the liver and kidneys. This substance
A	(DFG 2004). OSHA PEL±: TWA 100 ppm C 200 ppm 300	is probably carcinogenic to humans.
т .	ppm (5-minute maximum peak in any 3-hours) NIOSH REL: Ca Minimize workplace exposure	
A	concentrations. See Appendix A NIOSH IDLH: Ca 150 ppm See: 127184	
1		
PHYSICAL PROPERTIES	Boiling point: 121°C Melting point: -22°C Relative density (water = 1): 1.6 Solubility in water, g/100 ml at 20°C: 0.015	Vapour pressure, kPa at 20°C: 1.9 Relative vapour density (air = 1): 5.8 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.09 Octanol/water partition coefficient as log Pow: 2.9
ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms. The effects in the aquatic environment.	substance may cause long-term
	NOTES	

Depending on the degree of exposure, periodic medical examination is suggested. The odour warning when the exposure limit value is exceeded is insufficient. Do NOT use in the vicinity of a fire or a hot surface, or during welding. An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert. Card has been partly updated in April 2005. See section Occupational Exposure Limits.

Transport Emergency Card: TEC (R)-61S1897

NFPA Code: H2; F0; R0;

ADDITIONAL INFORMATION

ICSC: 0076

TETRACHLOROETHYLENE

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ICSC: 0077

International Chemical Safety Cards

THALLIUM









Ramor Thallium (metal) TI

ICSC# 0077

CAS# 7440-28-0

RTECS # XG3425000

UN#

3288

EC#

081-001-00-3

April 03, 2002 Validated



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE			IN ALL CASES CONSULT A DOCTOR!
•INHALATION	See Ingestion.	Local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
•SKIN	MAY BE ABSORBED! See Ingestion.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
•EYES		Safety goggles, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
INGESTION	Abdominal pain. Nausea. Vomiting. Headache. Weakness. Pain in the legs. Blurred vision. Loss of hair. Restlessness. Convulsions. Rapid heart beat. See Notes.	Do not eat, drink, or smoke during work. Wash hands before eating.	Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Give a slurry of activated charcoal in water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING		
Sweep spilled substance into sealable containers. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	other halogens, food and feedstuffs.	Do not transport with food and feedstuffs. T+ symbol R: 26/28-33-53		

(Extra personal protection: P3 filter respirator for toxic particles.)

S: 1/2-13-28-45-61
UN Hazard Class: 6.1
UN Packing Group: 1

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0077

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

THALLIUM ICSC: 0077

IHALLIUN	<u> </u>					
I M	PHYSICAL STATE; APPEARANCE: BLUISH-WHITE, VERY SOFT METAL. TURNS GREY ON EXPOSURE TO AIR.	ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.				
Р ·	PHYSICAL DANGERS:					
· o	CHEMICAL DANGERS:	INHALATION RISK: Evaporation at 20°C is negligible; a harmful concentration of airborne particles can,				
R	Reacts with strong acids. Reacts with fluorine and other halogens at room temperature.	however, be reached quickly when dispersed, especially if powdered.				
T						
A	OCCUPATIONAL EXPOSURE LIMITS: TLV: 0.1 mg/m³ as TWA (skin) (ACGIH 2001).	EFFECTS OF SHORT-TERM EXPOSURE: The substance may cause effects on the gastrointestinal tract, nervous system, kidneys				
N .	MAK: IIb (not established but data is available) (DFG 2005).	and cardiovascular system. May cause hair loss and atrophy of nails. Exposure may result in				
T		death when ingested. The effects may be delayed. Medical observation is indicated.				
D		EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:				
A		The substance may have effects on the				
т		cardiovascular system, nervous system and may cause hair loss. Animal tests show that this				
A		substance possibly causes toxicity to human reproduction or development.				
PHYSICAL PROPERTIES	Boiling point: 1457°C Melting point: 304°C	Relative density (water = 1): 11.9 Solubility in water: none				
The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur along the food chain, for example in freshwater organisms. This substance may be hazardous to the environment; special attention should be given to birds and mammals. It is strongly advised that this substance does not enter the environment. The substance may cause long-term effects in the aquatic environment.						
	NOTES					
Symptoms of acute thallium intoxication usually develop slowly; gastrointestinal symptoms (nausea, vomiting, abdominal pain) appear usually within few hours after exposure but neurological disorders and other symptoms may show after 2-5 days. Depending on the degree of exposure, periodic medical examination is indicated. Do NOT take working clothes home. See ICSC 0336 (Thallium sulfate), 1221 (Thallium carbonate).						

ADDITIONAL INFORMATION

Transport Emergency Card: TEC (R)-61GT5-1

ICSC: 0077 THALLIUM

(C) IPCS, CEC, 1994

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VINYL CHLORIDE

ICSC: 0082











Chloroethene
Chloroethylene
VCM
C₂H₃Cl / H₂C=CHCl
Molecular mass: 62.5
(cylinder)

ICSC # 0082 CAS # 75-01-4 RTECS # <u>KU9625000</u> UN # 1086 (stabilized) EC # 602-023-00-7 April 13, 2000 Validated



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZ SYMPTO		PREVENTION		FIRST AID/ FIRE FIGHTING
FIRE	Extremely flammable. Gives off irritating or toxic fumes (or gases) in a fire.		NO open flames, NO sparks NO smoking.	s, and	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out; in other cases extinguish with powder, carbon dioxide.
EXPLOSION	Gas/air mixtures are explosive.		Closed system, ventilation, explosion-proof electrical equipment and lighting. Use non- sparking handtools.		In case of fire: keep cylinder cool by spraying with water. Combat fire from a sheltered position.
EXPOSURE			AVOID ALL CONTACT!		IN ALL CASES CONSULT A DOCTOR!
·INHALATION	Dizziness. Drowsine Headache. Unconsci		Ventilation, local exhaust, o breathing protection.	r	Fresh air, rest. Refer for medical attention.
•SKIN	ON CONTACT WIT FROSTBITE.	TH LIQUID:	Protective gloves. Cold- insulating gloves. Protective clothing.	:	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes.
•EYES	Redness. Pain.		Safety goggles or eye protect in combination with breathin protection.		First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
·INGESTION	Do not eat, drink, or during work.		Do not eat, drink, or smoke during work.		
SPILLAGE	DISPOSAL		STORAGE		PACKAGING & LABELLING
Evacuate danger ar	ea! Consult an	Fireproof. Se	eparated from incompatible		

ICSC: 0082

expert! Ventilation. Remove all ignition sources. Personal protection: complete protective clothing including self-contained breathing apparatus.

materials .(See Chemical Dangers.) Cool. Store only if stabilized. Note: D F+ symbol T symbol R: 45-12 S: 53-45

UN Hazard Class: 2.1

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0082

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

VINYL CHLORIDE

I M P O R T A N T	PHYSICAL STATE; APPEARANCE: COLOURLESS COMPRESSED LIQUEFIED GAS, WITH CHARACTERISTIC ODOUR. PHYSICAL DANGERS: The gas is heavier than air, and may travel along the ground; distant ignition possible. Vinyl chloride monomer vapours are uninhibited and may form polymers in vents or flame arresters of storage tanks, resulting in blockage of vents. CHEMICAL DANGERS: The substance can under specific circumstances form peroxides, initiating explosive polymerization. The substance will polymerize readily due to heating and under the influence of air, light and on contact with a catalyst, strong oxidizing agents and metals such as copper and aluminium, with fire or explosion hazard. The substance decomposes on burning producing toxic and corrosive fumes (hydrogen chloride, phosgene). Attacks iron and steel in the presence of moisture. OCCUPATIONAL EXPOSURE LIMITS: TLV: 1 ppm as TWA; A1 (confirmed human carcinogen); (ACGIH 2004). MAK: Carcinogen category: 1; (DFG 2004). OSHA PEL: 1910.1017 TWA 1 ppm C 5 ppm 15-minute NIOSH REL: Ca See Appendix A NIOSH IDLH: Ca N.D. See: IDLH INDEX	consciousness. Medical observation is indicated. EFFECTS OF LONG-TERM OR REPEATED EXPOSURE: The substance may have effects on the liver, spleen, blood and peripheral blood vessels, and
PHYSICAL	Boiling point: -13°C Melting point: -154°C Relative density (water = 1): 0.9 (liquid) Density: 8 (vapour) at 15°C	Relative vapour density (air = 1): 2.2 Flash point: -78°C c.c.

PROPERTIES

g/l

Solubility in water:
none

Auto-ignition temperature: 472°C

Explosive limits, vol% in air: 3.6-33

Octanol/water partition coefficient as log Pow:
0.6

ENVIRONMENTAL DATA This substance may be hazardous to the environment; special attention should be given to ground water contamination.



NOTES

Depending on the degree of exposure, periodic medical examination is suggested. The odour warning when the exposure limit value is exceeded is insufficient. Do NOT use in the vicinity of a fire or a hot surface, or during welding. An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert. Card has been partly updated in April 2005. See section Occupational Exposure Limits.

Transport Emergency Card: TEC (R)-20S1086

NFPA Code: H 2; F 4; R 2;

ADDITIONAL INFORMATION

ICSC: 0082

VINYL CHLORIDE

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MANGANESE

ICSC: 0174











Mn Atomic mass: 54.9 (powder)

ICSC # 0174

CAS # 7439-96-5

RTECS # 009275000

November 27, 2003 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZ SYMPTO	II PERVENIUM II		FIRST AID/ FIRE FIGHTING	
FIRE	Combustible.		NO open flames.		Dry sand, special powder.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.		Prevent deposition of dust; closed system, dust explosion- proof electrical equipment and lighting.		
EXPOSURE			PREVENT DISPERSION OF DUST! A VOID EXPOSURE OF (PREGNANT) WOMEN!		
·INHALATION	Cough.		Local exhaust or breathing protection.		Fresh air, rest. Refer for medical attention.
•SKIN			Protective gloves.		Rinse and then wash skin with water and soap.
•EYES			Safety goggles, or eye protection in combination with breathing protection if powder.		First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
·INGESTION	Abdominal pain. Na	usea.	Do not eat, drink, or smoke during work.		Rinse mouth. Refer for medical attention.
SPILLAGE	DISPOSAL		STORAGE		PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place. (Extra personal protection: P2 filter respirator for harmful particles.)		om acids. Dry.			
SEE IMPORTANT INFORMATION ON BACK					
Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.					

MANGANESE

ICSC: 0174

	1					
	PHYSICAL STATE; APPEARANCE: GREY - WHITE POWDER	ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.				
1	PHYSICAL DANGERS: Dust explosion possible if in powder or	INHALATION RISK:				
м	granular form, mixed with air.	Evaporation at 20°C is negligible; a harmful				
	CHEMICAL DANGERS:	concentration of airborne particles can, however, be reached quickly when dispersed.				
P	Reacts slowly with water more rapidly with steam and acids forming flammable/explosive	EFFECTS OF SHORT-TERM EXPOSURE:				
О	gas (hydrogen - see ICSC0001) causing fire and explosion hazard.	The aerosol is irritating to the respiratory tract.				
R		EFFECTS OF LONG-TERM OR				
т	OCCUPATIONAL EXPOSURE LIMITS: TLV: 0.2 mg/m ³	REPEATED EXPOSURE: The substance may have effects on the lungs				
A	(as TWA); (ACGIH 2003).	and central nervous system, resulting in increased susceptibility to bronchitis,				
N	MAK: (Inhalable fraction) 0.5 mg/m³; Pregnancy risk group: C; (DFG 2007).	pneumonitis and neurologic, neuropsychiatric disorders (manganism). Animal tests show that this substance possibly causes toxicity to				
Т .	OSHA PEL*: C 5 mg/m ³ *Note: Also see specific listings for Manganese	human reproduction or development.				
D.	cyclopentadienyl tricarbonyl and Methyl cyclopentadienyl manganese tricarbonyl.					
A	NIOSH REL*: TWA 1 mg/m ³ ST 3 mg/m ³ *Note: Also see specific listings for Manganese					
т	cyclopentadienyl tricarbonyl, Methyl cyclopentadienyl manganese tricarbonyl, and					
A	Manganese tetroxide. NIOSH IDLH: 500 mg/m ³ (as Mn) See:					
PHYSICAL PROPERTIES	Boiling point: 1962°C Melting point: 1244°C Density: 7.47 g/cm ³	Solubility in water: none				
ENVIRONMENTAL DATA	This substance may be hazardous in the environm given to aquatic organisms.	nent; special attention should be				
NOTES						
Depending on the degree of exposure, periodic medical examination is suggested. The recommendations on this Card also apply to ferro manganese.						
ADDITIONAL INFORMATION						
ICSC: 0174	(C) IPCS, CEC, 1994	MANGANESE				

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1,1-DICHLOROETHANE



R: 11-22-36/37-52/53

F symbol

Xn symbol

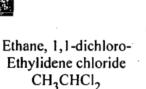
ICSC: 0249











Molecular mass: 99.0

ICSC # 0249 CAS# 75-34-3

RTECS # K10175000

UN# 2362

EC# 602-011-00-1

September 20, 1993 Validated





TYPES OF HAZARD/ EXPOSURE	ACUTE HAZ SYMPTO		PREVENTION		FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable. C irritating or toxic fur gases) in a fire.		NO open flames, NO sparks, and NO smoking.		Water spray, foam, powder, carbon dioxide.
EXPLOSION	Vapour/air mixtures explosive.	Vapour/air mixtures are cxplosive. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.		In case of fire: keep drums, etc., cool by spraying with water.	
EXPOSURE			PREVENT GENERATION OF MISTS!		
•INHALATION	Dizziness. Drowsiness. Dullness. Nausea. Unconsciousness.		Ventilation, local exhaust, or breathing protection.		Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin. Roughness.		Protective gloves		Remove contaminated clothes. Rinse skin with plenty of water or shower.
•EYES	Redness. Pain.	•	Safety spectacles.		First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Burning sensation. (Finhalation).			Rinse mouth. Refer for medical attention.	
SPILLAGE DISPOSAL		STORAGE		PACKAGING & LABELLING	
Collect leaking liquid in sealable Fireproof. So Chemical Da		Separated from: see Sangers. Cool. Marine pollutant.		e pollutant.	

sand or inert absorbent and remove to

safe place. Do NOT wash away into

sewer. Personal protection: self-

International Chemical Safety Cards

1,1-DICHLOROETHANE

ICSC: 0249

1,1-DICHLO	DROETHANE	icsc: v2
	PHYSICAL STATE; APPEARANCE: COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.	ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation and by ingestion.
	PHYSICAL DANGERS:	INHALATION RISK:
M	The vapour is heavier than air and may travel along the ground; distant ignition possible.	A harmful contamination of the air can be reached rather quickly on evaporation of this
P	CHEMICAL DANGERS:	substance at 20°C.
O ·	The substance decomposes on heating and on burning producing toxic and corrosive fumes including phosgene (see ICSC 0007) and	EFFECTS OF SHORT-TERM EXPOSURE The substance may cause effects on the central nervous system. Exposure at high levels may
R	hydrogen chloride (see ICSC 0163). Reacts violently withstrong oxidants, alkali metals and	result in unconsciousness.
T	earth-alkali metals, powdered metals, causing fire and explosion hazard. Attacks aluminium,	EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
A N	iron and polyethylene. Contact with strong caustic will cause formation of flammable and	The liquid defats the skin. The substance may have effects on the kidneys and liver.
т	toxic acetaldehyde gas.	
	OCCUPATIONAL EXPOSURE LIMITS: TLV: 100 ppm as TWA; A4 (not classifiable as	
D	a human carcinogen); (ACGIH 2004). MAK: 100 ppm, 410 mg/m³;	•
A	Peak limitation category: II(2); Pregnancy risk group: C; (DFG 2006).	
T	OSHA PEL: TWA 100 ppm (400 mg/m ³)	
A	NIOSH REL: TWA 100 ppm (400 mg/m ³) See Appendix C (Chloroethanes)	
	NIOSH IDLH: 3000 ppm See: <u>75343</u>	
	Boiling point: 57°C	Relative vapour density (air = 1): 3.4
PHYSICAL	Melting point: -98°C Relative density (water = 1): 1.2	Flash point: -6°C c.c. Auto-ignition temperature: 458°C
PROPERTIES	Solubility in water, g/100 ml at 20°C: 0.6 Vapour pressure, kPa at 20°C: 24	Explosive limits, vol% in air: 5.6-11.4 Octanol/water partition coefficient as log Pow: 1.8
ENVIRONMENTAL DATA		
	NOTES	

Do NOT use in the vicinity of a fire or a hot surface, or during welding. Card has been partly updated in October 2005: see sections Occupational Exposure Limits, EU classification, Emergency Response. Card has been partly updated in October 2006: see sections Occupational Exposure Limits.

Transport Emergency Card: TEC (R)-30GF1-1+11

NFPA Code: H 2; F 3; R 0;

ADDITIONAL INFORMATION

ICSC: 0249

1,1-DICHLOROETHANE

(C) IPCS, CEC, 1994

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1,2-DICHLOROETHANE

ICSC: 0250











Ethylene dichloride 1,2-Ethylene dichloride Ethane dichloride CICH, CH, CI / C, H, CI, Molecular mass: 98.96

ICSC# 0250 CAS# 107-06-2 RTECS # K10525000

UN# 1184

EC# 602-012-00-7

March 13, 1995 Validated







TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks, and NO smoking.	Water spray, foam, powder, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		AVOID ALL CONTACT!	IN ALL CASES CONSULT A DOCTOR!
•INHALATION	Abdominal pain. Cough. Dizziness. Drowsiness. Headache. Nausea. Sore throat. Unconsciousness. Vomiting. Symptoms may be delayed (see Notes).	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.
•SKIN	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
•EYES	Redness. Pain. Blurred vision.	Safety goggles face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
·INGESTION	Abdominal cramps. Diarrhoea. (Further see Inhalation).	Do not eat, drink, or smoke during work. Wash hands before	Give nothing to drink. Refer for medical attention.

	eating.	·			
SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING			
Evacuate danger area! Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Personal protection: self-contained breathing apparatus.	Fireproof. Separated from strong oxidants, food and feedstuffs, and other incompatible materials. See Chemical Dangers. Cool. Dry.	Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs. Marine pollutant. Note: E F symbol T symbol R: 45-11-22-36/37/38 S: 53-45 UN Hazard Class: 3 UN Subsidiary Risks: 6.1 UN Packing Group: II			
SEE IMPORTANT INFORMATION ON BACK					
Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.					

1 2-DICHLOROFTHANE

1,2-DICHL	OROETHANE	ICSC: 0250
	PHYSICAL STATE; APPEARANCE:	ROUTES OF EXPOSURE:
	COLOURLESS VISCOUS LIQUID, WITH	The substance can be absorbed into the body by
I	CHARACTERISTIC ODOUR. TURNS DARK ON EXPOSURE TO AIR, MOISTURE AND	inhalation of its vapour, through the skin and by ingestion.
M	LIGHT.	
	DINGIGAL BANGERS	INHALATION RISK:
P	PHYSICAL DANGERS: The vapour is heavier than air and may travel	A harmful contamination of the air can be reached very quickly on evaporation of this
0	along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic	
R	charges can be generated.	EFFECTS OF SHORT-TERM EXPOSURE:
T	CHEMICAL DANGERS: The substance decomposes on heating and on	The vapour is irritating to the eyes, the skin and the respiratory tract. Inhalation of the vapour may cause lung oedema (see Notes).
A .	burning producing toxic and corrosive fumes including hydrogen chloride (ICSC 0163) and	The substance may cause effects on the central nervous system, kidneys, liver, resulting in
N	phosgene (ICSC 0007). Reacts violently with aluminium, alkali metals, alkali amides,	impaired functions.
T	ammonia, bases, strong oxidants. Attacks many metals in presence of water. Attacks plastic.	EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
D	OCCUPATIONAL EXPOSURE LIMITS: TLV: 10 ppm as TWA; A4 (not classifiable as a	Repeated or prolonged contact with skin may cause dermatitis. This substance is probably carcinogenic to humans.
A .	human carcinogen); (ACGIH 2004). MAK: skin absorption (H);	
T	Carcinogen category: 2; (DFG 2004).	
A	OSHA PEL±: TWA 50 ppm C 100 ppm 200 ppm 5-minute maximum peak in any 3 hours	
	NIOSH REL: Ca TWA 1 ppm (4 mg/m ³) ST 2	

	ppm (8 mg/m³) <u>See Appendix A See Appendix</u> C (Chloroethanes) NIOSH IDLH: Ca 50 ppm See: <u>107062</u>	
PHYSICAL PROPERTIES	Boiling point: 83.5°C Melting point: -35.7°C Relative density (water = 1): 1.235 Solubility in water, g/100 ml: 0.87 Vapour pressure, kPa at 20°C: 8.7 Relative vapour density (air = 1): 3.42	Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2 Flash point: 13°C c.c. Auto-ignition temperature: 413°C Explosive limits, vol% in air: 6.2-16 Octanol/water partition coefficient as log Pow: 1.48
ENVIRONMENTAL DATA		

Depending on the degree of exposure, periodic medical examination is suggested. The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Immediate administration of an appropriate inhalation therapy by a doctor or a person authorized by him/her, should be considered. Card has been partly updated in October 2005. See sections Occupational Exposure Limits, Emergency Response.

Transport Emergency Card: TEC (R)-30GTF1-II

NFPA Code: H 2; F 3; R 0;

ADDITIONAL INFORMATION					
	7.1				
ICSC: 0250				1,2-DICHLOROETHANE	
		(C) IPCS,	CEC, 1994		

IMPORTANT LEGAL NOTICE:

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1,2-DICHLOROETHYLENE

ICSC: 0436











1,2-Dichloroethene Acetylene dichloride symmetrical Dichloroethylene C₂H₂Cl₂ / CICH=CHCl

Molecular mass: 96.95

ICSC # 0436

CAS# 540-59-0

RTECS # KV9360000

UN#

1150

EC # 602-026-00-3

July 05, 2003 Validated



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZ SYMPTO		PREVENTION		FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire.		NO open flames, NO sparks, and NO smoking.		Powder, water spray, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.		Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.		In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE			STRICT HYGIENE!		
•INHALATION	Cough. Sore throat. Nausea. Drowsiness Unconsciousness. Vo	Weakness.	Ventilation, local exhaust, of breathing protection.	or	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin.		Protective gloves.		Remove contaminated clothes. Rinse skin with plenty of water or shower.
•ÉYES	Redness. Pain.		Safety spectacles.		First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. (Further see Inhalation).		Do not eat, drink, or smoke during work.		Rinse mouth. Give plenty of water to drink. Refer for medical attention.
SPILLAGE DISPOSAL		STORAGE	PACKAGING & LABELLING		
Remove all ignition sources. Ventilation. Collect leaking and spilled Dangers.			Well closed. See Chemical Note: C		С

liquid in sealable containers as far as possible. Absorb remaining liquid in dry sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. (Extra personal protection: complete protective clothing including self-contained breathing apparatus.)

F symbol Xn symbol R: 11-20-52/53 S: 2-7-16-29-61 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0436

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

1,2-DICHLOROETHYLENE

ICSC: 0436

· · · · · · · · · · · · · · · · · · ·	III EENE	
i	PHYSICAL STATE; APPEARANCE: COLOURLESS LIQUID, WITH CHARACTERISTIC ODOUR.	ROUTES OF EXPOSURE: The substance can be absorbed into the body to inhalation of its vapour and by ingestion.
M	PHYSICAL DANGERS:	INHALATION RISK:
. Р	The vapour is heavier than air and may travel along the ground; distant ignition possible.	A harmful contamination of the air will be reached quickly on evaporation of this
0	CHEMICAL DANGERS:	substance at 20°C; on spraying or dispersing, however, much faster.
R	The substance decomposes on heating or under the influence of air, light and moisture	EFFECTS OF SHORT-TERM EXPOSURI
Т	producing toxic and corrosive fumes including hydrogen chloride. Reacts with strong	The substance is irritating to the eyes and the respiratory tract. The substance may cause
A	oxidants. Reacts with copper or copper alloys, and bases to produce toxic chloroacetylene	effects on the central nervous system at high levels, resulting in lowering of consciousness
· N	which is spontaneously flammable in contact with air. Attacks plastic.	EFFECTS OF LONG-TERM OR
Ť	OCCUPATIONAL EXPOSURE LIMITS:	REPEATED EXPOSURE: The liquid defats the skin. The substance may
D	TLV: 200 ppm as TWA; (ACGIH 2003). MAK: 200 ppm, 800 mg/m³; Peak limitation category: II(2);	have effects on the liver
A	(DFG 2002). OSHA PEL: TWA 200 ppm (790 mg/m ³)	
T	NIOSH REL: TWA 200 ppm (790 mg/m ³)	
A	NIOSH IDLH: 1000 ppm See: <u>540590</u>	
	D-iling point 550C	Plant and 200
PHYSICAL PROPERTIES	Boiling point: 55°C Relative density (water = 1): 1.28 Solubility in water: poor Relative vapour density (air = 1): 3.34	Flash point: 2°C c.c. Auto-ignition temperature: 460°C Explosive limits, vol% in air: 9.7-12.8 Octanol/water partition coefficient as log Pow 2
ENVIRONMENTAL DATA		

This compound has two isomers, cis and trans. Data for the isomers: cis-isomer (CAS 156-59-2), trans isomer (CAS 156-60-5), other boiling point 60.3, melting point -81.5°C (cis), -49.4°C (trans); flash point c.c. 6°C (cis), 2-4°C (trans);

relative density (water = 1) 1.28 (cis), 1.26 (trans); vapour pressure 24.0 kPa (cis), 35.3 kPa (trans) at 20°C; relative density of the vapour/air-mixture at 20°C (air = 1): 1.6 (cis), 1.8 (trans); octanol/water partition coefficient as log Pow: 1.86 (cis), 2.09 (trans). Depending on the degree of exposure, periodic medical examination is suggested.

Transport Emergency Card: TEC (R)-30GF1-I+II

NFPA Code: H2; F3; R2;

ADDITIONAL INFORMATION

ICSC: 0436

1,2-DICHLOROETHYLENE

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ANTIMONY

ICSC: 0775











Antimony black Antimony regulus Stibium Sb Atomic mass: 121.8

ICSC# 0775 CAS# 7440-36-0 RTECS # CC4025000

UN# 2871

October 12, 2006 Validated





[500501 12, 2000 1 minuted						
TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS		PREVENTION		FIRST AID/ FIRE FIGHTING	
FIRE			NO open flames. NO contact with oxidants, halogens, acid(s).		water spray, foam, powder, carbon dioxide	
EXPLOSION	fire and explosion on contact		Prevent deposition of dust; closed system, dust explosion- proof electrical equipment and lighting.			
EXPOSURE			PREVENT DISPERSION OF DUST!			
•INHALATION	Cough. (See Ingestion).		Local exhaust or breathing protection.		Fresh air, rest.	
•SKIN			Protective gloves.		Remove contaminated clothes. Rinse and then wash skin with water and soap.	
•EYES	Redness. Pain.		Safety goggles, or eye protection in combination with breathing protection if powder.		First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.	
•INGESTION	Abdominal pain. Vomiting. Diarrhoea.		Do not eat, drink, or smoke during work.		Rinse mouth. Refer for medical attention if you feel unwell.	
SPILLAGE DISPOSAL		STORAGE	PACKAGING & LABELLING			
			om oxidants, acids, pod and feedstuffs. UN Hazard Class: 6. UN Packing Group:		azard Class: 6.1	
	*					

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0775

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

ANTIMONY

ICSC: 0775

	ADDITIONAL INFORMA	ΓΙΟΝ
ICSC 0776 antimony tr	•	Transport Emergency Card: TEC (R)-61GT5-III
antimony. See ICSC 00	325°C, 1440°C, 1587 °C, 1750°C. The recommend 12 antimony trioxide, ICSC 1224 antimony trichles	dations on this card apply only to metallic oride, ICSC 0220 antimony pentafluoride and
· · · · · · · · · · · · · · · · · · ·	NOTES	
ENVIRONMENTAL DATA		
PHYSICAL PROPERTIES	Boiling point: 1635 °C Melting point: 630 °C Density: 6.7 g/cm ³	Solubility in water: none
A .	(as Sb). NIOSH IDLH: 50 mg/m ³ (as Sb) See: <u>7440360</u>	
T .	NIOSH REL*: TWA 0.5 mg/m ³ *Note: The REL also applies to other antimony compounds	
· A	PEL also applies to other antimony compounds (as Sb).	
D	(DFG 2006). OSHA PEL*: TWA 0.5 mg/m ³ *Note: The	
Т	Carcinogen category: 2; Germ cell mutagen group: 3B	
N	OCCUPATIONAL EXPOSURE LIMITS: TLV: 0.5 mg/m³ as TWA (ACGIH 2006). MAK:	lungs, resulting in pneumoconiosis.
A	(stibine; see ICSC 0776).	cause dermatitis, especially when exposed to fumes. The substance may have effects on the
T	oxides; see ICSC 0012). Reacts violently with oxidants,, causing fire and explosion hazard. On contact with acids may emit toxic gas	EFFECTS OF LONG-TERM OR REPEATED EXPOSURE: Repeated or prolonged contact with skin may
O R	CHEMICAL DANGERS: On combustion, forms toxic fumes (antimony	May cause mechanical irritation to the eyes.
Р	granular form, mixed with air.	EFFECTS OF SHORT-TERM EXPOSURE
M	PHYSICAL DANGERS: Dust explosion possible if in powder or	INHALATION RISK: A harmful concentration of airborne particles can be reached quickly when dispersed.
I	SILVER-WHITE, LUSTROUS, HARD, BRITTLE LUMPS OR DARK GRAY POWDER	The substance can be absorbed into the body by inhalation of its aerosol.
*	PHYSICAL STATE; APPEARANCE:	ROUTES OF EXPOSURE:

ICSC: 0775

ANTIMONY
(C) IPCS, CEC, 1994

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CARBON TETRACHLORIDE

CAS No: 56-23-5

RTECS No: FG4900000 UN No: 1846

EC No: 602-008-00-5

Tetrachloromethane Tetrachlorocarbon

Tetra

CCI4

Molecular mass: 153.8

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			In case of fire: keep drums, etc., cool by spraying with water.
· · · · · · · · · · · · · · · · · · ·	<u> </u>	·	
EXPOSURE		AVOID ALL CONTACT!	
Inhalation	Dizziness. Drowsiness. Headache. Nausea. Vomiting.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
Eyes	Redness. Pain.	Face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion	Abdominal pain. Diarrhoea. (Further see Inhalation).	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give plenty of water to drink. Refer for medical attention.
SPILLAGE DIS	POSAL	PACKAGING & LABELLING	
remaining liquid remove to safe enter the enviro	liquid in covered containers. Absorb I in sand or inert absorbent and place. Do NOT let this chemical inment. Personal protection: ctive clothing including self-contained ratus.	T Symbol N Symbol R: 23/24/25-40-48/23-52/53-59 S: (1/2-)23-36/37-45-59-61 UN Hazard Class: 6.1 UN Pack Group: II	Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs. Marine pollutant.
EMERGENCY	RESPONSE	SAFE STORAGE	,
	rgency Card: TEC (R)-61S1846	Separated from food and feedstuffs, Ventilation along the floor. Cool.	metals (see Chemical Dangers).











IMPORTANT DATA

Physical State; Appearance

COLOURLESS LIQUID, WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air.

Chemical dangers

On contact with hot surfaces or flames this substance decomposes forming toxic and corrosive fumes (hydrogen chloride ICSC0163, chlorine fumes ICSC0126, phosgene ICSC0007). Reacts with some metals such as aluminium, magnesium, zinc causing fire and explosion hazard.

Occupational exposure limits

TLV: 5 ppm as TWA, 10 ppm as STEL; (skin); A2 (suspected human carcinogen); (ACGIH 2004).

MAK: 0.5 ppm, 3.2 mg/m³; Peak limitation category: II(2); skin absorption (H); Carcinogen category: 4; Pregnancy risk group: D; (DFG 2004).

Routes of exposure

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20-C.

Effects of short-term exposure

The substance is irritating to the eyes. The substance may cause effects on the liver, kidneys and central nervous system, resulting in unconsciousness. Medical observation is indicated.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. This substance is possibly carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 76.5-C

Melting point: -23-C

Relative density (water = 1): 1.59

Solubility in water, g/100 ml at 20·C: 0.1 poor

Vapour pressure, kPa at 20•C: 12.2 Relative vapour density (air = 1): 5.3

Relative density of the vapour/air-mixture at 20-C (air = 1): 1.5

Octanol/water partition coefficient as log Pow: 2.64

ENVIRONMENTAL DATA

The substance is harmful to aquatic organisms. This substance may be hazardous in the environment; special attention should be given to its impact on the ozone layer.

NOTES

Use of alcoholic beverages enhances the harmful effect.

Depending on the degree of exposure, periodic medical examination is suggested.

The odour warning when the exposure limit value is exceeded is insufficient.

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

Card has been partly updated in April 2005. See sections Occupational Exposure Limits, Emergency Response.

ADDITIONAL INFORMATION

LEGAL NOTICE

Neither the EC nor the IPCS nor any person acting on behalf of the EC or the IPCS is responsible

TRICHLOROETHYLENE

0081 October 2000

CAS No: 79-01-6 RTECS No: KX4550000 UN No: 1710

EC No: 602-027-00-9

1,1,2-Trichloroethylene Trichloroethene Ethylene trichloride Acetylene trichloride C₂HCl₃ / GICH=CCl₂ Molecular mass: 131.4

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Combustible under specific conditions. See Notes.		In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION		Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT GENERATION OF MISTS! STRICT HYGIENE!	
Inhalation	Dizziness. Drowsiness. Headache. Weakness. Nausea. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration _may_be needed. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with wate and soap.
Eyes	Redness. Pain.	Safety spectacles, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion	Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give plenty of water to drink. Rest.
SPILLAGE DIS	SPOSAL	PACKAGING & LABELLING	
Ventilation. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Personal protection: filter respirator for organic gases and vapours. Do NOT let this chemical enter the environment.		T Symbol R: 45-36/38-52/53-67 S: 53-45-61 UN Hazard Class: 6.1 UN Pack Group: III	Do not transport with food and feedstuffs. Marine pollutant.
EMERGENCY	RESPONSE	SAFE STORAGE	
Transport Eme NFPA Code: H	rgency Card: TEC (R)-61S1710	Separated from metals (see Chemical feedstuffs, Dry. Keep in the dark, Ven	









Prepared in the context of cooperation between the International Programme on Chemical Safety and the European Commission © IPCS 2004

IMPORTANT DATA

Physical State; Appearance

COLOURLESS LIQUID, WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers

On contact with hot surfaces or flames this substance decomposes forming toxic and corrosive fumes (phosgene, hydrogen chloride). The substance decomposes on contact with strong alkali producing dichloroacetylene, which increases fire hazard. Reacts violently with metal powders such as magnesium, aluminium, titanium, and barium. Slowly decomposed by light in presence of moisture, with formation of corrosive hydrochloric acid.

Occupational exposure limits

TLV: 50 ppm as TWA; 100 ppm as STEL; A5; BEI issued; (ACGIH 2004).

MAK: Carcinogen category: 1; Germ cell mutagen group: 3B; (DFG 2004).

Routes of exposure

The substance can be absorbed into the body by inhalation and by ingestion.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20-C.

Effects of short-term exposure

The substance is irritating to the eyes and the skin. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system, resulting in respiratory failure. Exposure could cause lowering of consciousness.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the central nervous system, resulting in loss of memory. The substance may have effects on the liver and kidneys (see Notes). This substance is probably carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 87-C
Melting point: -73-C
Relative density (water = 1): 1.5
Solubility in water, g/100 ml at 20-C: 0.1
Vapour pressure, kPa at 20-C: 7.8

Relative vapour density (air = 1): 4.5
Relative density of the vapour/air-mixture at 20-C (air = 1): 1.3
Auto-ignition temperature: 410-C
Explosive limits, vol% in air: 8-10.5
Octanol/water partition coefficient as log Pow: 2.42

ENVIRONMENTAL DATA

The substance is harmful to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

Combustible vapour/air mixtures difficult to ignite, may be developed under certain conditions.

Use of alcoholic beverages enhances the harmful effect.

Depending on the degree of exposure, periodic medical examination is suggested.

The odour warning when the exposure limit value is exceeded is insufficient.

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.

Card has been partly updated in October 2004. See sections Occupational Exposure Limits, EU classification, Emergency Response.

ADDITIONAL INFORMATION

LEGAL NOTICE

Neither the EC nor the IPCS nor any person acting on behalf of the EC or the IPCS is responsible

Project Material Safety Data Sheets

Appendix I

12 November 2010 Project No. 0042525 North Penn Area 2 Superfund Site Hatfield Township, Pennsylvania



Diesel Fuel (All Types)

MSDS No. 9909

EMERGENCY OVERVIEW CAUTION!

OSHA/NFPA COMBUSTIBLE LIQUID - SLIGHT TO MODERATE IRRITANT **EFFECTS CENTRAL NERVOUS SYSTEM** HARMFUL OR FATAL IF SWALLOWED

Moderate fire hazard. Avoid breathing vapors or mists. May cause dizziness and drowsiness. May cause moderate eye irritation and skin irritation (rash). Long-term, repeated exposure may cause skin cancer.

If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs).



NFPA 704 (Section 16)

1. CHEMICAL PRODUCT AND COMPANY INFORMATION

Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095-0961

(800) 424-9300 EMERGENCY TELEPHONE NUMBER (24 hrs): CHEMTREC Corporate Safety (732) 750-6000 COMPANY CONTACT (business hours):

MSDS INTERNET WEBSITE:

www.hess.com (See Environment, Health, Safety & Social Responsibility)

SYNONYMS:

Ultra Low Sulfur Diesel (ULSD); Low Sulfur Diesel; Motor Vehicle Diesel Fuel; Diesel

Fuel #2; Dyed Diesel Fuel; Non-Road, Locomotive and Marine Diesel Fuel; Tax-exempt

Diesel Fuel

See Section 16 for abbreviations and acronyms.

COMPOSITION and CHEMICAL INFORMATION ON INGREDIENTS

INGREDIENT NAME (CAS No.)

CONCENTRATION PERCENT BY WEIGHT

Diesel Fuel (68476-34-6) Naphthalene (91-20-3)

100 Typically < 0.01

A complex mixture of hydrocarbons with carbon numbers in the range C9 and higher. Diesel fuel may be dyed (red) for tax purposes. May contain a multifunctional additive.

HAZARDS IDENTIFICATION 3.

Contact with liquid or vapor may cause mild irritation.

SKIN

May cause skin irritation with prolonged or repeated contact. Practically non-toxic if absorbed following acute (single) exposure. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

INGESTION

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

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Diesel Fuel (All Types)

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INHALATION

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY

Similar products produced skin cancer and systemic toxicity in laboratory animals following repeated applications. The significance of these results to human exposures has not been determined - see Section 11 Toxicological Information.

IARC classifies whole diesel fuel exhaust particulates as probably carcinogenic to humans (Group 2A). NIOSH regards whole diesel fuel exhaust particulates as a potential cause of occupational lung cancer based on animal studies and limited evidence in humans.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash).

FIRST AID MEASURES 4.

EYES

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION

Remove person to fresh air. If person is not breathing provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT:

> 125 °F (> 52 °C) minimum PMCC

AUTOIGNITION POINT:

494 °F (257 °C)

OSHA/NFPA FLAMMABILITY CLASS: 2 (COMBUSTIBLE)

LOWER EXPLOSIVE LIMIT (%):

0.6

UPPER EXPLOSIVE LIMIT (%):

7.5

FIRE AND EXPLOSION HAZARDS

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or Halon.

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LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

FIRE FIGHTING INSTRUCTIONS

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

6. ACCIDENTAL RELEASE MEASURES

ACTIVATE FACILITY'S SPILL CONTINGENCY OR EMERGENCY RESPONSE PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE

HANDLING PRECAUTIONS

Handle as a combustible liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Diesel fuel, and in particular low and ultra low sulfur diesel fuel, has the capability of accumulating a static electrical charge of sufficient energy to cause a fire/explosion in the presence of lower flashpoint products such as gasoline. The accumulation of such a static charge occurs as the diesel flows through pipelines, filters, nozzles and various work tasks such as tank/container filling, splash loading, tank cleaning; product sampling; tank gauging; cleaning, mixing, vacuum truck operations, switch loading, and product agitation. There is a greater potential for static charge accumulation in cold temperature, low humidity conditions.

Documents such as 29 CFR OSHA 1910.106 "Flammable and Combustible Liquids, NFPA 77 Recommended Practice on Static Electricity, API 2003 "Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents and ASTM D4865 "Standard Guide for Generation and Dissipation of Static

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Diesel Fuel (All Types)

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Electricity in Petroleum Fuel Systems" address special precautions and design requirements involving loading rates, grounding, bonding, filter installation, conductivity additives and especially the hazards associated with "switch loading." ["Switch Loading" is when a higher flash point product (such as diesel) is loaded into tanks previously containing a low flash point product (such as gasoline) and the electrical charge generated during loading of the diesel results in a static ignition of the vapor from the previous cargo (gasoline).]

Note: When conductivity additives are used or are necessary the product should achieve 25 picosiemens/meter or greater at the handling temperature.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION

EXPOSURE LIMITS

	•	Exposure Limits	
Components (CAS No.)	Source	TWA/STEL	Note
Diocel Fuel (coars as c)	OSHA	5 mg/m, as mineral oil mist	
Diesel Fuel: (68476-34-6)	ÄCGIH	100 mg/m³ (as totally hydrocarbon vapor) TWA	A3, skin
Nonhibelene (ex ee e)	OSHA	10 ppm TWA	
Naphthalene (91-20-3)	ACGIH	10 ppm TWA / 15 ppm STEL	A4, Skin

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile, neoprene, or PVC are recommended. Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

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Diesel Fuel (All Types)

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RESPIRATORY PROTECTION

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910 134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL and CHEMICAL PROPERTIES

APPEARANCE

Clear, straw-yellow liquid. Dyed fuel oil will be red or reddish-colored.

ODOR

Mild, petroleum distillate odor

BASIC PHYSICAL PROPERTIES

BOILING RANGE:

320 to 690 oF (160 to 366 °C)

VAPOR PRESSURE:

0.009 psia @ 70 °F (21 °C)

VAPOR DENSITY (air = 1):

SPECIFIC GRAVITY (H₂O = 1): 0.83 to 0.88 @ 60 °F (16 °C)

PERCENT VOLATILES:

100 %

EVAPORATION RATE:

Slow; varies with conditions

SOLUBILITY (H2O):

Negligible

STABILITY and REACTIVITY 10.

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID and INCOMPATIBLE MATERIALS

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Keep away from strong oxidizers; Viton ®; Fluorel ®

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

TOXICOLOGICAL PROPERTIES 11.

ACUTE TOXICITY

Acute dermal LD50 (rabbits): > 5 ml/kg

Acute oral LD50 (rats): 9 ml/kg

Primary dermal irritation: extremely irritating (rabbits)

Draize eye irritation: non-irritating (rabbits)

Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY

Carcinogenic: OSHA: NO

IARC: NO NTP: NO ACGIH: A3

Studies have shown that similar products produce skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

MUTAGENICITY (genetic effects)

This material has been positive in a mutagenicity study.

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Diesel Fuel (All Types)

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ECOLOGICAL INFORMATION

Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

DISPOSAL CONSIDERATIONS

Consult federal, state and local waste regulations to determine appropriate disposal options.

14. TRANSPORTATION INFORMATION

PROPER SHIPPING NAME:

HAZARD CLASS and PACKING GROUP:

DOT IDENTIFICATION NUMBER:

DOT SHIPPING LABEL:

Diesel Fuel

3. PG III

NA 1993 (Domestic) UN 1202 (International)

None

Placard (International Only):

Use Combustible Placard if shipping in bulk domestically

15. REGULATORY INFORMATION

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other regulations at the state and/or local level. Consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

ACUTE HEALTH CHRONIC HEALTH FIRE

SUDDEN RELEASE OF PRESSURE

REACTIVE

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product may contain listed chemicals below the de minimis levels which therefore are not subject to the supplier notification requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372. If you may be required to report releases of chemicals listed in 40 CFR 372.28, you may contact Hess Corporate Safety if you require additional information regarding this product.

CALIFORNIA PROPOSITON 65 LIST OF CHEMICALS

This product contains the following chemicals that are included on the Proposition 65 "List of Chemicals" required by the California Safe Drinking Water and Toxic Enforcement Act of 1986:

INGREDIENT NAME (CAS NUMBER)

Diesel Engine Exhaust (no CAS Number listed)

Date Listed 10/01/1990

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 3 (Combustible Liquid) and Class D, Division 2, Subdivision B (Toxic by other means)

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Diesel Fuel (All Types)

MSDS No. 9909

OTHER INFORMATION 16.

NFPA® HAZARD RATING HEALTH:

FIRE:

2

REACTIVITY:

0

Refer to NFPA 704 "Identification of the Fire Hazards of Materials" for further information

HMIS® HAZARD RATING

HEALTH:

* Chronic

FIRE:

PHYSICAL:

SUPERSEDES MSDS DATED: 02/28/2001

ABBREVIATIONS:

AP = Approximately

< = Less than

> = Greater than

N/A = Not Applicable

N/D = Not Determined ppm = parts per million

National Toxicology Program

ACRONYMS:

ACGIH	American Conference of Governmental	NIP	National Toxicology Program
	Industrial Hygienists	OPA	Oil Pollution Act of 1990
AIHA	American Industrial Hygiene Association	OSHA	U.S. Occupational Safety & Health
ANSI	American National Standards Institute		Administration
	(212) 642-4900	PEL	Permissible Exposure Limit (OSHA)
API	American Petroleum Institute	RCRA	Resource Conservation and Recovery
	(202) 682-8000		Act
CERCLA	Comprehensive Emergency Response,	REL	Recommended Exposure Limit (NIOSH)
	Compensation, and Liability Act	SARA	Superfund Amendments and
DOT	U.S. Department of Transportation	•	Reauthorization Act of 1986 Title III
	[General info: (800) 467-4922]	SCBA	Self-Contained Breathing Apparatus
EPA	U.S. Environmental Protection Agency	SPCC	Spill Prevention, Control, and
HMIS	Hazardous Materials Information System		Countermeasures
IARC	International Agency For Research On	STEL	Short-Term Exposure Limit (generally
	Cancer		15 minutes)
MSHA	Mine Safety and Health Administration	TLV	Threshold Limit Value (ACGIH)
NFPA	National Fire Protection Association	TSCA	Toxic Substances Control Act
	(617)770-3000	TWA	Time Weighted Average (8 hr.)
NIOSH	National Institute of Occupational Safety	WEEL	Workplace Environmental Exposure
	and Health		Level (AIHA)
NOIC	Notice of Intended Change (proposed	WHMIS	Canadian Workplace Hazardous
	change to ACGIH TLV)		Materials Information System

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Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

Revision Date: 10/18/2006 Page 7 of 7 MSDS Number: A2052 * * * * Effective Date: 08/03/07 * * * * * Supercedes: 02/16/06





24 Hour Emergency Telephone: 908 CHEMTREC: 1-800-424-9300

National Response in Canada CANUTEC: 613-696-6666

Outside U.S. And Canada Chembrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and Nati

ALCONOX®

1. Product Identification

Synonyms: Proprietary blend of sodium linear alkylaryl sulfonate, alcohol sulfate, phosphates, and carbonates.

CAS No.: Not applicable.

Molecular Weight: Not applicable to mixtures. Chemical Formula: Not applicable to mixtures.

Product Codes: A461

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous	
Alconox® proprietary detergent mixture	N/A	90 - 100%	Yes	

3. Hazards Identification

Emergency Overview

CAUTION! MAY BE HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO EYES AND RESPIRATORY TRACT.

SAF-T-DATA^(tm) Ratings (Provided here for your convenience)

Health Rating: 1 - Slight Flammability Rating: 0 - None Reactivity Rating: 0 - None Contact Rating: 2 - Moderate Lab Protective Equip: GOGGLES; LAB COAT; PROPER GLOVES Storage Color Code: Green (General Storage)

Potential Health Effects

Inhalation:

May cause irritation to the respiratory tract. Symptoms may include coughing and shortness of breath.

May cause irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea.

Skin Contact:

No adverse effects expected.

Eye Contact:

May cause irritation, redness and pain.

Chronic Exposure:

No information found

Aggravation of Pre-existing Conditions:

No information found.

4. First Aid Measures

Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention. Skin Contact:

Wash exposed area with soap and water. Get medical advice if irritation develops.

Eve Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Not expected to be a fire hazard.

Explosion:

No information found

Fire Extinguishing Media:

Dry chemical, foam, water or carbon dioxide.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. When mixed with water, material foams profusely. Small amounts of residue may be flushed to sewer with plenty of water.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Moisture may cause material to cake. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

None established.

Ventilation System

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, Industrial Ventilation, A Manual of Recommended Practices, most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to dust or mist is apparent and engineering controls are not feasible, a particulate respirator (NIOSH type N95 or better filters) may be worn. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear protective gloves and clean body-covering clothing.

Eve Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

White powder interspersed with cream colored flakes.

Odor:

No information found.

Solubility:

Moderate (1-10%)

Specific Gravity: No information found.

pH:

No information found.

% Volatiles by volume @ 21C (70F):

Boiling Point:

No information found. **Melting Point:**

No information found

Vapor Density (Air=1): No information found.

Vapor Pressure (mm Hg);

No information found.

Evaporation Rate (BuAc=1):

No information found.

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization:

Will not occur.

Incompatibilities:
No information found.

Conditions to Avoid:

No information found.

11. Toxicological Information

No LD50/LC50 information found relating to normal routes of occupational exposure.

NTP	Carcinogén	
Known	Anticipated	IARC Category
No	No	None
	Known	

12. Ecological Information

Environmental Fate: This product is biodegradable. Environmental Toxicity: No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

Chemical Weapons Convention: No TSCA 1 SARA 311/312: Acute: Yes Chronic: No Reactivity: No (Pure / Solid)

\Chemical Inventory Status - Ingredient		TCCA	EC	Japan	Australia
Alconox® proprietary detergent mixture		Yes	No		No .
\Chemical Inventory Status -	Part 2\				
Ingredient				nada NDSL	Phil.
Alconox® proprietary detergent mixture		No	No		. No
\Federal, State & Internation					A 313
\Federal, State & Internation	-SAI	TPQ	Lis	SAR st Che	A 313 mical Catg
\Federal, State & Internation	−SAI RQ	TPQ	Lis	SAR st Che	A 313
\Federal, State & Internation Ingredient	-SAI RQ No	VA 302- TPQ No	Lis No No	SAR St Che	A 313 mical Catg
\Federal, State & Internation Ingredient Alconox® proprietary detergent mixture	-SAF RQ No No aal Regulat	A 302- TPQ No	Lis No No Part :	SAR st Che	A 313 mical Catg No SCA-

TSCA 12(b): No

CDTA:

Australian Hazchem Code: None allocated

Poison Schedule: None allocated.

WHMIS:

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 0 Flammability: 0 Reactivity: 0

Label Hazard Warning:

CAUTION! MAY BE HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO EYES AND RESPIRATORY TRACT.

Label Precautions:

Avoid contact with eyes.

Keep container closed.

Use with adequate ventilation.

Avoid breathing dust.

Wash thoroughly after handling.

Label First Aid:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes. In all cases, get medical attention.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 3.

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Prepared by: Environmental Health & Safety Phone Number: (314) 654-1600 (U.S.A.)

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

EMERGENCY OVERVIEW DANGER!

EXTREMELY FLAMMABLE - EYE AND MUCOUS MEMBRANE IRRITANT - EFFECTS CENTRAL NERVOUS SYSTEM - HARMFUL OR FATAL IF SWALLOWED - ASPIRATION HAZARD



High fire hazard. Keep away from heat, spark, open flame, and other ignition sources.

If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs). Contact may cause eye, skin and mucous membrane irritation. Harmful if absorbed through the skin. Avoid prolonged breathing of vapors or mists. Inhalation may cause irritation, anesthetic effects (dizziness, nausea, headache, intoxication), and respiratory system effects.

Long-term exposure may cause effects to specific organs, such as to the liver, kidneys, blood, nervous system, and skin. Contains benzene, which can cause blood disease, including anemia and leukemia.

1. CHEMICAL PRODUCT and COMPANY INFORMATION

(rev. Jan-04)

Amerada Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs):

COMPANY CONTACT (business hours):

MSDS Internet Website

CHEMTREC (800)424-9300

Corporate Safety (732)750-6000

ebsite www.hess.com/about/environ.html

SYNONYMS:

Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded

Motor or Automotive Gasoline

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and INFORMATION ON INGREDIENTS *

(rev. Jan-04)

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT				
Gasoline (86290-81-5)	100				
Benzene (71-43-2)	0.1 - 4.9 (0.1 - 1.3 reformulated gasoline)				
n-Butane (106-97-8)	< 10				
Ethyl Alcohol (Ethanol) (64-17-5)	0 - 10				
Ethyl benzene (100-41-4)	< 3				
n-Hexane (110-54-3)	0.5 to 4				
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0				
Tertiary-amyl methyl ether (TAME) (994-05-8)	0 to 17.2				
Toluene (108-88-3)	1 - 25				
1,2,4- Trimethylbenzene (95-63-6)	< 6				
Xylene, mixed isomers (1330-20-7)	1 - 15				

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol or MTBE and/or TAME). Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

Revision Date: 01/08/04

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

3. HAZARDS IDENTIFICATION (rev. Dec-97)

EYES

Moderate irritant. Contact with liquid or vapor may cause irritation.

SKIN

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

INGESTION

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

INHALATION

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY

Contains benzene, a regulated human carcinogen. Benzene has the potential to cause anemia and other blood diseases, including leukemia, after repeated and prolonged exposure. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with systemic toxicity. See also Section 11 - Toxicological Information.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash). Chronic respiratory disease, liver or kidney dysfunction, or pre-existing central nervous system disorders may be aggravated by exposure.

4. FIRST AID MEASURES

(rev. Dec-97)

EYES

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

<u>SKIN</u>

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION

Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

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MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

FIRE FIGHTING MEASURES (rev. Dec-97)

FLAMMABLE PROPERTIES:

FLASH POINT:

-45 °F (-43°C)

AUTOIGNITION TEMPERATURE:

highly variable; > 530 °F (>280 °C)

OSHA/NFPA FLAMMABILITY CLASS:

1A (flammable liquid)

LOWER EXPLOSIVE LIMIT (%):

1.4%

UPPER EXPLOSIVE LIMIT (%):

7.6%

FIRE AND EXPLOSION HAZARDS

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

During certain times of the year and/or in certain geographical locations, gasoline may contain MTBE and/or TAME. Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration - refer to NFPA 11 "Low Expansion Foam - 1994 Edition."

FIRE FIGHTING INSTRUCTIONS

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

ACCIDENTAL RELEASE MEASURES (rev. Dec-97) 6.

ACTIVATE FACILITY SPILL CONTINGENCY OF EMERGENCY PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product

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MATERIAL SAFETY DATA SHEFT

Gasoline, All Grades

MSDS No. 9950

vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE (rev. Dec-97)

HANDLING PRECAUTIONS

******USE ONLY AS A MOTOR FUEL****** ******DO NOT SIPHON BY MOUTH******

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION (rev. Jan-04)					
EXPOSURE LIMITS Component (CAS No.)		-		Exposure Limits	
	Source	TWA (ppm)	STEL (ppm)	Note	
Gasoline (86290-81-5)	ACGIH	300	500	A3	
Benzene (71-43-2)	OSHA	1	5	Carcinogen	
	ACGIH	0.5	2.5	A1, skin	
	USCG	1 .	5		
n-Butane (106-97-8)	ACGIH	800	_	2003 NOIC: 1000 ppm (TWA) Aliphatic	
,				Hydrocarbon Gases Alkane (C1-C4)	
Ethyl Alcohol (ethanol) (64-17-5)	OSHA	1000	-		
	ACGIH -	1000		A4	
Ethyl benzene (100-41-4)	OSHA	100			
	ACGIH	100	125	A3	

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MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

Component (CAS No.)	•		•	Exposure Limits
	Source	TWA (ppm)	STEL (ppm)	Note
n-Hexane (110-54-3)	OSHA	500	_	
	ACGIH -	50		skin
Methyl-tertiary butyl ether [MTBE] (1634-04-4)	ACGIH	50		A3
Tertiary-amyl methyl ether [TAME] (994-05-8)			•••••	None established
Toluene (108-88-3)	OSHA	200		Ceiling: 300 ppm; Peak: 500 ppm (10 min.)
	ACGIH	50		A4 (skin)
1,2,4- Trimethylbenzene (95-63-6)	ACGIH	25		
Xylene, mixed isomers (1330-20-7)	OSHA	100		
	ACGIH	100	150	A4

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile or neoprene are recommended. Chemical protective clothing such as that made of of E.I. DuPont Tychem ®, products or equivalent is recommended based on degree of exposure.

Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

RESPIRATORY PROTECTION

A NIOSH-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection and limitations.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9.	PHYSICAL and CHEMICAL PR	₹OPERTIES	(rev. Jan-04)

APPEARANCE

A translucent, straw-colored or light yellow liquid

ODOF

A strong, characteristic aromatic hydrocarbon odor. Oxygenated gasoline with MTBE and/or TAME may have a sweet, ether-like odor and is detectable at a lower concentration than non-oxygenated gasoline.

ODOR THRESHOLD

e · ·	Odor Detection	Odor Recognition
Non-oxygenated gasoline:	0.5 - 0.6 ppm	0.8 - 1.1 ppm
Gasoline with 15% MTBE:	0.2 - 0.3 ppm	0.4 - 0.7 ppm
Gasoline with 15% TAME:	0.1 ppm	0.2 ppm

BASIC PHYSICAL PROPERTIES

BOILING RANGE: 85 to 437 °F (39 to 200 °C)

VAPOR PRESSURE: 6.4 - 15 RVP @ 100 °F (38 °C) (275-475 mm Hg @ 68 °F (20 °C)

VAPOR DENSITY (air = 1): AP 3 to 4 SPECIFIC GRAVITY ($H_2O = 1$): 0.70 – 0.78

EVAPORATION RATE: 10-11 (n-butyl acetate = 1)

PERCENT VOLATILES: 100 %

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MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

SOLUBILITY (H2O):

Non-oxygenated gasoline - negligible (< 0.1% @ 77 °F). Gasoline with 15% MTBE - slight (0.1 - 3% @ 77 °F); ethanol is readily soluble in water

10. STABILITY and REACTIVITY (rev. Dec-94)

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources

INCOMPATIBLE MATERIALS

Keep away from strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

11. TOXICOLOGICAL PROPERTIES

(rev: Dec-97)

ACUTE TOXICITY

Acute Dermal LD50 (rabbits): > 5 ml/kg

Acute Oral LD50 (rat): 18.75 ml/kg

Primary dermal irritation (rabbits): slightly irritating

Draize eye irritation (rabbits): non-irritating

Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY

Carcinogenicity: OSHA: NO IARC: YES - 2B

NTP: NO

ACGIH: YES (A3)

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

This product may contain methyl tertiary butyl ether (MTBE): animal and human health effects studies indicate that MTBE may cause eye, skin, and respiratory tract irritation, central nervous system depression and neurotoxicity. MTBE is classified as an animal carcinogen (A3) by the ACGIH.

12. ECOLOGICAL INFORMATION

(rev. Jan-04)

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations. If released, oxygenates such as ethers and alcohols will be expected to exhibit fairly high mobility in soil, and therefore may leach into groundwater. The API (www.api.org) provides a number of useful references addressing petroleum and oxygenate contamination of groundwater.

13. DISPOSAL CONSIDERATIONS

(rev. Dec-97)

Consult federal, state and local waste regulations to determine appropriate disposal options.

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MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

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14. TRANSPORTATION INFORMATION (rev. Jan-04)

DOT PROPER SHIPPING NAME:

DOT HAZARD CLASS and PACKING GROUP:

DOT IDENTIFICATION NUMBER:

DOT SHIPPING LABEL:

(1011 0011 0 1)

Gasoline 3. PG II

UN 1203

FLAMMABLE LIQUID



15. REGULATORY INFORMATION

(rev. Jan-04)

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) or, if not practical, the U.S. Coast Guard with follow-up to the National Response Center, as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

ACUTE HEALTH CHRONIC HEALTH

SUDDEN RELEASE OF PRESSURE

REACTIVE

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION WT. PERCENT
Benzene (71-43-2)	0.1 to 4.9 (0.1 to 1.3 for reformulated gasoline)
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Toluene (108-88-3)	1 to 15
1,2,4- Trimethylbenzene (95-63-6)	·. <6
Xylene, mixed isomers (1330-20-7)	1 to 15

US EPA guidance documents (www.epa.gov/tri) for reporting Persistent Bioaccumulating Toxics (PBTs) indicate this product may contain the following deminimis levels of toxic chemicals subject to Section 313 reporting:

INGREDIENT NAME (CAS NUMBER)

Polycyclic aromatic compounds (PACs) Benzo (g.h.i) perylene (191-24-2)

Lead (7439-92-1)

CONCENTRATION - Parts per million (ppm) by weight

17 2.55 0.079

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MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 2 (Flammable Liquid)

Class D, Division 2A (Very toxic by other means) and Class D, Division 2B (Toxic by other means)

16. OTHER INFORMATION (rev. Jan-04)

NFPA® HAZARD RATING HEALTH:

1 Slight

FIRE:

3 Serious

REACTIVITY:

0 Minimal

HMIS® HAZARD RATING

HEALTH:

1 * Slight

FIRE:

3 Serious

Minimal

REACTIVITY:

* CHRONIC

SUPERSEDES MSDS DATED:

12/30/97

ABBREVIATIONS:

AP = Approximately

< = Less than

> = Greater than

N/A = Not Applicable

N/D = Not Determined

ppm = parts per million

ACRONYMS:

ACGIH	American Conference of Governmental	NTP	National Toxicology Program
•	Industrial Hygienists	OPA	Oil Pollution Act of 1990
AIHA	American Industrial Hygiene Association	OSHA.	U.S. Occupational Safety & Health
ANSI	American National Standards Institute		Administration
	(212)642-4900	PEL	Permissible Exposure Limit (OSHA)
API -	American Petroleum Institute	RCRA	Resource Conservation and Recovery Act
-	(202)682-8000	REL	Recommended Exposure Limit (NIOSH)
CERCLA	Comprehensive Emergency Response,	SARA	Superfund Amendments and
	Compensation, and Liability Act		Reauthorization Act of 1986 Title III
DOT	U.S. Department of Transportation	SCBA	Self-Contained Breathing Apparatus
	[General Info: (800)467-4922]	SPCC	Spill Prevention, Control, and
EPA	U.S. Environmental Protection Agency		Countermeasures
HMIS	Hazardous Materials Information System	STEL	Short-Term Exposure Limit (generally 15
IARC	International Agency For Research On		minutes)
	Cancer	TLV	Threshold Limit Value (ACGIH)
MSHA	Mine Safety and Health Administration	TSCA	Toxic Substances Control Act
NFPA	National Fire Protection Association	TWA	Time Weighted Average (8 hr.)
	(617)770-3000	WEEL	Workplace Environmental Exposure
NIOSH	National Institute of Occupational Safety	•	Level (AIHA)
	and Health	WHMIS	Workplace Hazardous Materials
NOIC	Notice of Intended Change (proposed		Information System (Canada)
	change to ACGIH TLV)		

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

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SCOTT SPECIALTY GASES -- ISOBUTYLENE IN AIR, (SEE SUPPL.) -- 6665-01-449-8454

```
Product ID: ISOBUTYLENE IN AIR, (SEE SUPPL.)
MSDS Date:11/20/1997
FSC:6665
NIIN:01-449-8454
Status Code: A
Kit Part:Y
MSDS Number: CLFCR
=== Responsible Party ===
Company Name: SCOTT SPECIALTY GASES
Address:2330 HAMILTON BLVD
City:SOUTH PLAINFIELD
State:NJ
ZIP:07080
Country: US
Info Phone Num: 908-754-7700
Emergency Phone Num: 908-754-7700
Resp. Party Other MSDS Num.:M-704/E-1
CAGE: 54262
=== Contractor Identification ===
Company Name: PHOTOVAC INTL INC/DBA PHOTOVAC MONITORING INSTRUMENTS
Address: UNK
Box:UNK
City:DEER PARK
State:NY
ZIP:11729
Country: US
Phone: 000-000-0000
CAGE: 70123
Company Name: PINE ENVIRONMENTAL SERVICES INC
Address: 379 PRINCETON-HIGHTSTOWN RD
Box:City:CRANBURY
State:NJ
ZIP:08512
Country: US
Phone: 609-371-9663
Contract Num: SP0200-99-M-T071
CAGE:1JSC4
Company Name: SCOTT SPECIALTY GASES
Address:2330 HAMILTON BLVD
Box:City:SOUTH PLAINFIELD
State:NJ
ZIP:07080
Country:US
Phone: 908-754-7700
CAGE:54262
======= Composition/Information on Ingredients =========
Ingred Name: ISOBUTYLENE
CAS:115-11-7
RTECS #:UD0890000
Fraction by Wt: 1-1500% PPM
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Ingred Name:AIR

Fraction by Wt: BALANCE Hazards Identification Reports of Carcinogenicity:NTP:NO IARC:NO Health Hazards Acute and Chronic: ACUTE EFFECTS: NONE. CHRONIC EFFECTS: NONE KNOWN. Explanation of Carcinogenicity: CARCINOGENICITY (U.S. ONLY): NTP - NO; IARC MONOGRAPHS - NO; OSHA REGULATED - NO. Effects of Overexposure: NONE. Medical Cond Aggravated by Exposure: NONE KNOWN. ========== First Aid Measures First Aid: IN EVENT OF EXPOSURE, CONSULT A PHYSICIAN. INHALATION: IMMEDIATELY REMOVE VICTIM TO FRESH AIR. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN. EYE CONTAC T: NONE. SKIN CONTACT: NONE. INGESTION: NONE. Flash Point: NONFLAMMABLE Extinguishing Media: USE WHAT IS APPROPRIATE FOR SURROUNDING FIRE. Fire Fighting Procedures: WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECIVE CLOTHING. KEEP FIRE EXPOSED CYLINDERS COOL WITH WATER SPRAY. IF POSSIBLE, STOP THE PRODUCT FLOW. Unusual Fire/Explosion Hazard: CYLINDER RUPTURE MAY OCCUR UNDER FIRE CONDITIONS. COMPRESSED AIR AT HIGH PRESSURE WILL ACCELERATE THE COMBUSTION OF FLAMMABLE MATERIALS. ========= Accidental Release Measures ======================= Spill Release Procedures: EVACUATE AND VENTILATE AREA. REMOVE LEAKING CYLINDER TO EXHAUST HOOD OR SAFE OUTDOOR AREA. SHUT OFF SOURCE IF POSSIBLE AND REMOVE SOURCE OF HEAT. Handling and Storage Precautions: HANDLING: SECURE CYLINDER WHEN USING TO PROTECT FROM FALLING. USE SUITABLE HAND TRUCK TO MOVE CYLINDERS... STORAGE: STORE IN WELL VENTILATED AREAS. KEEP VALVE PROTECTION CAP ON CYLINDERS WHEN NOT IN USE . Other Precautions: PROTECT CONTAINERS FROM PHYSICAL DAMAGE. DO NOT DEFACE CYLINDERS OR LABELS. CYLINDERS SHOULD BE REFILLED BY QUALIFIED PRODUCERS OF COMPRESSED GAS. SHIPMENT OF A COMPRESSED GAS CYLINDER WHICH HAS NOT B EEN FILLED BY THE OWNER OR WITH HIS WRITTEN CONSENT IS A VIOLATION OF FEDERAL LAW (49 CFR)

====== Exposure Controls/Personal Protection =========

Respiratory Protection: IN CASE OF LEAKAGE, USE SELF-CONTAINED BREATHING APPARATUS.

Ventilation: PROVIDE ADEQUATE GENERAL AND LOCAL EXHAUST VENTILATION. Protective Gloves: NONE

Eye Protection: SAFETY GLASSES.

Other Protective Equipment: SAFETY SHOES WHEN HANDLING CYLINDERS. Supplemental Safety and Health

VENDOR (CAGE 70123) PART NUMBER: 350005. THIS ENTRY DESCRIBES ONE PART, SERIAL NUMBER XXXXX, ISOBUTYLENE IN AIR, OF A FIELD KIT. SEE THIS SAME NSN, SERIAL NUMBER XXXXX, A 10 HOUR RECHARGEABLE BATTERY

PACK, FOR DATA ON SECOND PART OF KIT. HCC:G3 Vapor Density: .991(AIR=1 Spec Gravity:GAS Evaporation Rate & Reference: GAS Solubility in Water:18.68CM3/1020C Appearance and Odor: COLORLESS, ODORLESS GAS =============== Stability and Reactivity Data Stability Indicator/Materials to Avoid:YES OXIDIZING AGENTS. Stability Condition to Avoid: STABLE UNDER NORMAL STORAGE CONDITIONS. AVOID STORAGE IN POORLY VENTILATED AREAS AND STORAGE NEAR A HEAT Hazardous Decomposition Products: NONE. Conditions to Avoid Polymerization: WILL-NOT-OCCUR. Toxicological Information: LETHAL CONCENTRATION (LC50): NONE ESTABLISHED. LETHAL DOSE 50 (LD50): NOT APPLICABLE. TERATOGENICITY : N/A. REPRODUCTIVE EFFECTS: N/A. MUTGENICITY: N/AP. Ecological: NO ADVERSE ECOLOGICAL EFFECTS ARE EXPECTED. Waste Disposal Methods: DISPOSE OF NON-REFILLABLE CYLINDERS IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS. ALLOW GAS TO VENT SLOWLY TO ATMOSPHERE IN AN UNCONFINED AREA OR EXHAUST HOOD. IF THE CYLINDERS ARE THE REF ILLABLE TYPE, RETURN CYLINDERS TO SUPPLIER WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PRO TECTION CAPS IN PLACE. Transport Information: CONCENTRATION: 1 - 1500 PPM. DOT DESCRIPTION (US ONLY): PROPER SHIPPING NAME: COMPRESSED GASSES, N.O.S.; HAZARD CLASS: 2.2 (NONFLAMMABLE); UN 1956; REPORTABLE QUANTITIES: NONE. LABELING: NONFLAMMABLE GAS. ADR/RID (EU ONLY): CLASS 2, 1A. SPECIAL PRECAUTIONS: CYLINDERS SHOULD BE TRANSPORTATED IN A SECURE UPRIGHT POSITION IN A WELL VENTILATED TRUCK.

SARA Title III Information: THE THRESHOLD PLANNING QUANTIRY FOR THES MIXTURE IS 10,000 LBS.
Federal Regulatory Information: OSHA: PROCESS SAFETY MANAGEMENT: MINOR

COMPONENT IS NOT LISTED IN APPENDIX A OF 29 CFR 1910.119 AS A HIGHLY HAZARDOUS CHEMICAL. TSCA: MIXTURE IS NOT LISTED IN TSCA INVENTORY. EU NUMBER: N/A. NUMBER IN ANNES 1 OF DIR 67/548: MIXTURE IS NOT LISTED IN ANNES 1. EU CLASSIFICATION: N/AP. R: 20; S: 9.

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Air Monitoring Documentation Form

Appendix J

12 November 2010 Project No. 0042525 North Penn Area 2 Superfund Site Hatfield Township, Pennsylvania



ERM

Ambient Air Monitoring Form

Project Name: Project Number Date:	er:			, .	·			
			Documen	t Routing			_	
FSO	·	Retain co	py in site h	ealth & safe	ty file.			
1. Work Inf	formation							
ERM Repres	sentative:	:					*. *	
	Members &	-						
Employers:	Members a							
Limpioyers.								
2. Monitori				,				-
Time	A	mbient Ai	r Monitor	ring Local	tion		Res	ults
		<i>:</i>					-	
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3. Completi	ion		. ,					
	Nar	ne:			·			
	Signatu	ire:						
								••

Form Rev.: 10-09

Emergency Drill Evaluation Form

Appendix K

12 November 2010 Project No. 0042525 North Penn Area 2 Superfund Site Hatfield Township, Pennsylvania



Emergency Drill Evaluation Form

Project Name: Project Number:	•				
		Document Rou	iting		
FSO	Retain co	py in site health	& safety file.	,	
1. Basic Information		•			
Date of the Drill:					
Drill Facilitator:	<u>.</u>				·
	Name		,	Signature	
2. Describe the Drill Sco	enario below	7	-	•	
	*			_	
•				·	
		-			
3. Post-drill Review					٠.
Evaluation Date:		,			
a. List the Positive Attrib	outes of the D	Orill below			
					·
b. List the Opportunities	for Improve	ment below		·	
				• •	
c. List the corrective action	ons taken and	d their comple	etion date b	pelow	
Corrective Action		Assigned to		Completio	n Date
			· .		
				,	1

Daily Safety Meeting Documentation Form

Appendix L

12 November 2010 Project No. 0042525 North Penn Area 2 Superfund Site Hatfield Township, Pennsylvania



ERM

Daily Safety Meeting Documentation Form

	rth Penn Area 2 Superfund Site
Project Number:	
Meeting Date & Time:	
Meeting Leader:	
	Document Routing
FSO Ret	ain copy in site health & safety file.
What work will be conducted or	site today and by whom?
Work Task	Conducted By
•	
What overlapping operations/sir	nultaneous operations will occur today?
	ajor Incidents, Near Misses, Unsafe Acts or Unsafe
Conditions discussed today?	
	·
List any new/short-service pers	onnel on site today?
List any new / short-service pers	onnel on site today?
List any new/short-service pers	onnel on site today?
	Core Topics - All Site Workers and Visitors
	Core Topics - All Site Workers and Visitors
Safety Meeting What PPE is required in order	Core Topics - All Site Workers and Visitors er to enter the work zone?
Safety Meeting What PPE is required in orde What are the potential hazar	Core Topics - All Site Workers and Visitors or to enter the work zone? ds associated with today's work. How will they be managed?
Safety Meeting What PPE is required in order What are the potential hazar What are the potential impact	Core Topics - All Site Workers and Visitors er to enter the work zone? ds associated with today's work. How will they be managed? ets of planned activities to: Visitors? Nearby workers? Public?
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Safety Meeting What PPE is required in order What are the potential hazar What are the potential impact Is everyone aware that they a What happens and who do y facility, how will you be aler Who do you contact if you h Where is fire extinguisher, fire Are any work permits require Are any work permits require Have all excavation / borehom accordance with ERM and cle Have all tools / equipment / Will a follow-up safety meet Has anything unexpected or	Core Topics - All Site Workers and Visitors er to enter the work zone? ds associated with today's work. How will they be managed? ets of planned activities to: Visitors? Nearby workers? Public? are empowered to stop work if something is questionable or unsafe? ou contact if there is an injury or emergency? If working at an active ted of an emergency and what will you do? ave questions, or before deviating from written procedures? rest aid kit, eyewash, safety shower located? red? Are permits completed and posted in plain view of workers? ole locations been cleared of underground utilities/structures, in ient-specific subsurface clearance procedures? Vehicles been inspected today to ensure safe operating condition?

Form Rev.: 10-09



Daily Safety Meeting Documentation Form

Project Name: Project Number:	North Penn A	rea 2 Superfund Site		
Meeting Date & Time: Meeting Leader:		•	-	
Wiccing Leader.				
Safety Topics	Related to ERM 2009	Incident Trends - All Site	Workers and	Visitors
What activities fixed open-bl	es occurring today could lade knives is not permitt	result in hand injuries? Is eve ed without cut-resistant glove	ryone aware thes?	at the use of
		day? How will we specifically		ertion?
What areas o	f the site have slip/trip/f	all hazards? Are everyone's v	vork boots in g	ood shape?
☐ How will the	on-site team avoid vehic	le accidents? Is everyone awa	re that taking t	
the road for r	nore than 2 seconds (for a	any reason) leads to vehicle ac	cidents?	
Who attended the	safety meeting today (employees, subcontractors,	vicitors)2	
Name	Company	Signature	Sign-In	Sign-Out
			Initials*	Initials**
•				
		•		
		•		
		yee is fit for performing wo		
		volved in work activities?		
Nan	ne	Company	Arriva	l Time
•				
•	•			

Emergency Telephone Numbers

Appendix M

12 November 2010 Project No. 0042525 North Penn Area 2 Superfund Site Hatfield Township, Pennsylvania

Table 1 Emergency Telephone Numbers - North Penn Area 2 Superfund Site Hatfield Township, Pennsylvania

EMERGENCY CONTACTS	PERSON OR AGENCY	TELEPHONE NUMBER
Police		911
Fire		911
Ambulance		911
Hospital (Grand View Hospital)		(215) 453-4672 Emerg. Room (215) 453-4000 General
Poison Control		(800) 962-1253
Supervising Contractor (ERM)	(b) (4) (Project Coordinator)	(b) (4) (office) (cell)
	(b) (4), EIT (Project Manager)	(b) (4) pffice) (cell)
Settling Defendant / Owner (AMETEK, Inc.)	Tom Deeney	(b) (4) (office) (b) (6) (cell)
Settling Defendant / Owner (Penn Color, Inc.)	Bill Ponticello	(b) (4) (office) .) (b) (4), (b) (6) (cell)
EPA Remedial Project Manager	Sharon Fang, PE	(215) 814-3018 (office) (215) 514-8674 (cell)
PADEP Case Manager	Dustin Armstrong	(610) 832-6206 (office)
EPA Region III Emergency Hotline		(215) 814-9016
National Response Center		(800) 424-8802
PADEP Emergency Hotline		(484) 250-5900

•

Appendix B

Remedial Design Site Management Plan

AMETEK, Inc. and Penn Color, Inc.

Remedial Design Site Management Plan

North Penn Area 2 Superfund Site Hatfield Township, Pennsylvania

12 November 2010

0042525

Environmental Resources Management, Inc. 350 Eagleview Boulevard, Suite 200 Exton, Pennsylvania 19341

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1.0 INTRODUCTION

This Remedial Design Site Management Plan (SMP) has been prepared by Environmental Resources Management, Inc. (ERM) on behalf of AMETEK, Inc. and Penn Color, Inc. to present general procedures and requirements for on-Site activities associated with the Remedial Design (RD) for the North Penn Area 2 Superfund Site – Operable Unit #2 (Site) in Hatfield Township, Pennsylvania.

This SMP has been prepared in accordance with the Record of Decision (ROD) issued in April 2009 and the Administrative Settlement Agreement and Order on Consent (AOC) issued on 27 September 2010 which references pertinent requirements of the draft Consent Decree (CD). This SMP is included as an appendix to the Remedial Design Work Plan (RDWP).

This SMP addresses the following on-Site items:

- health and safety;
- communications, access, and security;
- support facilities;
- waste management; and
- emergency response and spill control.

This SMP addresses on-Site activities that are anticipated to occur during the RD. A copy of the SMP, along with the Site-specific Health and Safety Plan (HASP), will be maintained at the Site during all on-Site RD activities.

1.1 REMEDIAL DESIGN SCOPE OF WORK

Work performed on-Site during the RD will be conducted in accordance with the RDWP, this SMP, and the Remedial Design / Draft Remedial Action Health and Safety Plan (HASP), as well as the ROD, AOC, and CD. The major anticipated on-Site activities during the RD work include the following pre-design investigation tasks:

- the installation and surveying of three stream level monitoring points in the intermittent stream in November 2010;
- a round of water level measurements in all Site wells and the intermittent stream in November 2010, and
- a round of groundwater sampling from all Site wells and water level measurements in all Site wells and the intermittent stream in spring of 2011.

1.2 SITE HEALTH AND SAFETY

The HASP is provided as an appendix to the RDWP.

All RD work performed on-Site will be performed in accordance with the HASP. Field personnel will review the HASP and be familiar with elements/requirements specific to their work prior to performing the work. This includes completing the minimum training requirements stipulated in the HASP.

2.0 COMMUNICATIONS, ACCESS, AND SITE SECURITY

2.1 REMEDIAL DESIGN PROJECT TEAM

The RD project team is composed of several entities, which are summarized below.

- Settling Defendants / Owners Messrs. Thomas Deeney
 (AMETEK) and William Ponticello (Penn Color) Responsible for
 implementing the requirements of the Settling Defendants in the
 CD.
- Supervising Contractor (b) (4) (Project Coordinator), (b) (4) (Project Manager), ERM Responsible for implementing and managing the RD.
- United States Environmental Protection Agency (EPA) Remedial Project Manager (RPM) - Ms. Sharon Fang, EPA - responsible for oversight of the remedial design and monitoring compliance of the remedial design with the CD.
- Pennsylvania Department of Environmental Protection (PADEP)
 Case Manager Mr. Dustin Armstrong, PADEP responsible for PADEP assistance on State permit equivalencies.

The Project Manager will ensure compliance with the RDWP and associated plans, and will serve as Site Safety Officer and Emergency Coordinator.

A Site contact list is provided in Table 1 below.

2.2 SITE OWNERSHIP AND ACCESS

The Site is currently owned by Penn Color and Site access needs will be coordinated with Penn Color. All locations anticipated to be included in the pre-design investigation or design tasks are located on the Penn Color property and no access agreement or easement is necessary for work associated with those wells or the intermittent stream. However, if the former well M-6 location needs to be accessed, an access agreement or easement will be obtained by the Settling Defendants or the Supervising Contractor.

2.3 COMMUNICATIONS

ERM

The Supervising Contractor will coordinate all field activities and Site access needs with Penn Color.

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During the RD, communications will be facilitated through monthly progress reports submitted by the Settling Defendants to EPA in accordance with the CD. Additional communication will be facilitated as needed through mail, electronic mail, and meetings.

A Site contact list is provided in Table 1 below.

2.4 SITE SECURITY

A fence encloses the facility portion of the Penn Color property (the Site). Two entrances from public roads are gated but generally open. The areas that will be accessed during the pre-design investigation tasks are located within and outside of the fenced facility portion of the Site. There is no fence between the wetland work areas and the property/Site boundary.

Due to the limited and short-term duration of the pre-design investigation tasks, security of associated equipment, materials, and supplies is not anticipated to be necessary during the RD. All personnel on-Site for the pre-design investigation tasks will sign in and out on the Supervising Contractor's Daily Safety Meeting Documentation Form (provided in the HASP that is an appendix to the RDWP), which will be used to coordinate response actions and/or communication in the event that a Site emergency occurs.

3.0 SITE FACILITIES

The existing facilities and utilities available at the Site, with Penn Color approval, are expected to provide sufficient support for the RD efforts. No supplemental facilities are expected but will be provided by the Supervising Contractor if they become necessary for the RD.

3.1 PARKING

Vehicles will be parked in the existing parking lot by Richmond Road or, with Penn Color approval, will be parked in a designated location near the work area. Parking locations may be otherwise coordinated by the Supervising Contractor with Penn Color.

3.2 TELEPHONE SERVICE

Cell phones will be used as the primary means of communication with/by on-Site personnel. Cell phones will be accessible to personnel in each work area. Cell phone service at the Site shall be verified for sufficient coverage prior to being relied upon. If the cell phone service is insufficient, the Supervising Contractor will determine alternative means for communication (e.g., two-way radios). A list of emergency response contacts and phone numbers for key project personnel is provided in Table 1 below. This list will be readily available to the on-Site personnel at all times during the RD activities. The list will be updated as necessary to reflect up-to-date key personnel working on the project.

3.3 DECONTAMINATION FACILITIES

Decontamination of personnel is not expected to be necessary during RD activities. Decontamination of equipment during the RD will be in accordance with the Remedial Design Sampling and Analysis Plan provided as an appendix to the RDWP.

3.4 STORAGE FOR SUPPLIES AND MATERIALS

Due to the limited and short-term duration of the pre-design investigation tasks, on-Site storage for associated equipment, materials, and supplies is not anticipated to be necessary during the RD.

3.5 SANITARY FACILITIES AND TRASH DISPOSAL

Due to the limited and short-term duration of the pre-design investigation tasks, the existing Penn Color sanitary facilities will be utilized, with Penn Color approval.

The Supervising Contractor will make arrangements for containerization and disposal of trash off-Site when necessary. Certain waste streams (e.g., food and office waste) may be placed in Penn Color's on-Site dumpsters, with Penn Color approval, or will be brought off-Site with personnel.

3.6 POTABLE WATER

During the RD field activities, on-Site personnel will bring potable water on-Site as needed for uses such as drinking and washing.

4.0 WASTE MANAGEMENT

The Remedial Design Sampling and Analysis Plan (an appendix to the RDWP) addresses the management of investigation-derived waste associated with the RD pre-design investigation tasks. The EPA Identification Number for the Site is PAD002342475.

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5.0 EMERGENCY RESPONSE AND SPILL CONTROL

This section addresses preparedness, communications, and response procedures that may be required during the implementation of the RD field activities. This section provides measures to be taken to avoid unacceptable releases to the environment, and measures to mitigate any such releases, during RD field activities. Emergency response procedures are also presented in the HASP.

5.1 EMERGENCY COORDINATOR

During all RD field activities, the Supervising Contractor Project Manager will serve as the primary Emergency Coordinator. The Emergency Coordinator may assign an individual(s) to be his alternate or to assume Emergency Coordinator responsibilities in his absence.

At all times during the work, there will be at least one individual on the Site or on call (if after normal working hours) with the responsibility for coordinating all emergency response measures. The Emergency Coordinator and his alternate(s) shall be familiar with all aspects of the RDWP, including this RD Site Management Plan, current field activities, the location and characteristics of materials handled, the overall Site layout, and proper and appropriate channels of communication/notification.

The Emergency Coordinator is responsible for training pertinent personnel on the emergency response and spill control procedures.

5.2 COMMUNICATIONS

As described in Section 3.2 above, cell phones will be used as the primary means of on-Site and off-Site communication and cell phones will be accessible to personnel in each work area.

A list of emergency response contacts and phone numbers for key project personnel is provided in Table 1 below. This list will be readily available to the on-Site personnel at all times during the RD activities. The list will be updated as necessary to reflect up-to-date key personnel working on the project.

5.3 DIRECTIONS TO THE HOSPITAL

Directions to the local hospital are provided below. These directions will be available on-Site at all times during the RA.

Grand View Hospital 700 Lawn Avenue Sellersville, PA 18960 215-453-4674 Emergency Room Number 215-453-4000 General Number

Directions to Grand View Hospital from the Site:

- Turn left onto Richmond Road out of the Site parking lot (go 0.5 mile),
- Turn left at Unionville Pike (go 0.8 mile),
- Turn left at Bethlehem Pike/PA-309 North (go 5.6 miles),
- Take the exit toward PA-563/Perkasle (go 0.1 mile),
- Turn right at Lawn Avenue (go 0.5 mile), and
- End at Grand View Hospital (on the right).

Total Estimated Time: 13 minutes Total Estimated Distance: 7.5 miles

A map depicting these directions is provided in the HASP.

5.4 EMERGENCY RESPONSE PROCEDURES

Foul Weather Contingency Planning and Response Activities

Operations will be conducted throughout the project to manage / respond to potential storm events. Weather forecasting will be performed to enable advance preparation for storm events. If the conditions warrant, field activities will be shut down temporarily or postponed.

Spill Emergency Response

If on-Site personnel observe any spill or uncontrolled release of a contaminated or potentially contaminated material, the following actions will be taken.

Notify the Emergency Coordinator or his alternate.

- Take immediate measures, under the direction of the Emergency Coordinator, to stop, contain, or control the release within as minimal an area as possible. These measures may include the following:
 - Stop operations or processes that are causing the release or that may contribute to the release.
 - Use sand, absorbents, or other dike materials to control spills.
 - Use water to suppress dust emissions.
- Collect and containerize release-related contaminated materials for on-Site management or off-Site disposal in accordance with state, federal, and local regulations, as appropriate.

Spill control materials will be stored in a storage trailer or similar facility.

Fire Response

If a fire occurs, the Emergency Coordinator, local fire department, Project Coordinator, and Owner will be immediately notified. During RD field activities, each Site vehicle will have a fire extinguisher. All personnel will have appropriate training for fire extinguisher use, or such training will be given during on-Site health and safety meetings. If Site personnel cannot safely extinguish the fire immediately, the Emergency Coordinator will evacuate the area in accordance with the HASP and wait for the fire department. If a situation arises that may result in an explosion, Site personnel will evacuate the area immediately and notify the Emergency Coordinator.

Medical Emergency Response

If an on-Site incident occurs in which personal injury or illness is confirmed or suspected, the Emergency Coordinator will take the following actions as necessary.

- Ensure conditions are appropriate to proceed with rescue.
- Don appropriate personal protective equipment (PPE).
- Remove the exposed or injured individual(s) from immediate danger.
- Decontaminate affected personnel, as appropriate.
- Obtain ambulance transport to the local hospital, in the event of any injury or illness deemed by the Site Safety Officer to require medical surveillance or treatment.
- Evacuate other personnel until it is safe for work to resume.

Whenever there is a release, fire, or explosion, the Emergency Coordinator will immediately attempt to identify the character, source, and extent of contamination, to the extent safely possible. Concurrently, the Emergency Coordinator will assess possible direct and indirect hazards to human health or the environment (on-Site and off-Site) that may result from the release, fire, or explosion. Based upon this assessment, the Emergency Coordinator will determine whether evacuation of Site personnel and local individuals is required and will immediately notify appropriate authorities (police and fire department) if necessary.

Evacuation procedures include the following:

- Notification via audible alarms The Emergency Coordinator will utilize portable air horns (or automobile car horns in absence of an air horn) to sound audible alarms.
- Assembly / rally points The default assembly point will be the Site trailer area, or as otherwise identified during the daily health and safety meeting.
- Accounting for project team members and subcontractors In the
 event that an emergency requires evacuation to an assembly point, the
 Emergency Coordinator will be responsible for reviewing the Site signin log to account for the presence of all project team members and
 subcontractors on-Site at the time of the emergency.

Additional information concerning evacuation procedures is provided in the HASP.

5.5 EMERGENCY COORDINATOR RESPONSIBILITIES

Whenever there is an imminent or actual emergency situation (i.e., one that threatens human health or the environment), the Emergency Coordinator or alternate will:

- notify all on-Site personnel associated with or impacted by the RD field activity, and
- notify the Supervising Contractor Project Manager.

The Project Manager will immediately notify the Project Coordinator and Owner. The Project Manager will work with the on-Site personnel as necessary to assess the severity of the release/spill and to determine whether it is a reportable release. The Project Manager will then work with the Project Coordinator and Owner to determine the appropriate emergency response agencies to be notified.

In the event that the release is found to be reportable, the Project Coordinator will notify the EPA Remedial Project Manager, or, if the RPM is unavailable, EPA's Alternate Project Coordinator. If neither of these persons is available, the Project Coordinator will notify the EPA Region III hotline at (215) 814-9016 and PADEP hotline at (484) 250-5900.

During an emergency, the Emergency Coordinator will take all measures necessary to ensure that fires, explosions, and releases do not occur, recur, or spread to other areas of the Site. These measures will include, when applicable, stopping processes and operations, collecting and containing released material, and removing or isolating containers.

The Emergency Coordinator will be responsible for the documentation and reporting of the time, date, and details of all emergency and related incidents.

The Emergency Coordinator will also be responsible for ensuring the management of contaminated or potentially contaminated materials and equipment involved in the emergency response in accordance with applicable state, federal, and local regulations.

5.6 EMERGENCY CALL LIST

The emergency call list is provided below.

Table 1 Emergency Telephone Numbers – North Penn Area 2 Superfund Site Hatfield Township, Pennsylvania

EMERGENCY CONTACTS	PERSON OR AGENCY	TELEPHONE NUMBER
Police		911
Fire		911
Ambulance		911
Hospital (Grand View Hospital)		(215) 453-4672 Emerg. Room (215) 453-4000 General
Poison Control		(800) 962-1253
Supervising Contractor (ERM)	(b) (4), PE (Project Coordinator)	(b) (4) office) (cell)
	(b) (4) (Project Manager)	(b) (4) (office) (cell)
Settling Defendant / Owner (AMETEK, Inc.)	Tom Deeney	(b) (4) (office) (b) (6) 5 (cell)
Settling Defendant / Owner (Penn Color, Inc.)	Bill Ponticello	(b) (4) (office) (cell)
EPA Remedial Project Manager	Sharon Fang, PE	(215) 814-3018 (office) (215) 514-8674 (cell)
PADEP Case Manager	Dustin Armstrong	(610) 832-6206 (office)
EPA Region III Emergency Hotline		(215) 814-9016
National Response Center		(800) 424-8802
PADEP Emergency Hotline		(484) 250-5900

Appendix C

Remedial Design Sampling and Analysis Plan

AMETEK, Inc. and Penn Color, Inc.

Remedial Design Sampling and Analysis Plan

North Penn Area 2 Superfund Site Hatfield Township, Pennsylvania

12 November 2010

0042525

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Attachment 1 Quality Assurance Project Plan

Attachment 2 Laboratory Quality Assurance Project Plan (Lancaster Labs) - [Provided on disc only]

Attachment 3 Environmental Quality Policy Manual (Lancaster Labs) - [Provided on disc only]

1.0 INTRODUCTION

This Remedial Design Sampling and Analysis Plan (SAP) addresses sampling activities to be conducted as part of the Remedial Design (RD) at the North Penn Area 2 Superfund Site (Site) in Hatfield Township, Pennsylvania. This SAP is an appendix to the Remedial Design Work Plan (RDWP).

This SAP addresses the sampling to be included in the remedial design pre-investigation and includes information on sampling equipment, procedures, handling, and analysis. This SAP includes a Field Sampling Plan (FSP) and a Quality Assurance Project Plan (QAPP). The FSP components are included in this SAP report, and the QAPP is provided in Attachment 1 to this SAP. This SAP also includes the Lancaster Laboratories, Inc. (LLI) Laboratory QAPP as Attachment 2 to this SAP and the LLI Environmental Quality Policy Manual as Attachment 3 to this SAP.

2.0 SAMPLING OVERVIEW AND PROCEDURES

The RD will include a round of water level measurements in November 2010 and a round of water level measurements and groundwater sampling in spring of 2011 to support the capture zone analysis. Sampling will be conducted by the Supervising Contractor (ERM) or its subcontractor. The sampling event scheduling will be coordinated with the Site Owner (Penn Color). Tables 1 and 2 provide additional information about the groundwater sampling and analysis.

Sample collection, preparation, shipping and analysis methods will follow procedures set forth by the Unites States Environmental Protection Agency (EPA) and the Pennsylvania Department of Environmental Protection (PADEP), and are described in this SAP.

2.1 FIELD EQUIPMENT CALIBRATION AND MAINTENANCE

Field equipment requiring calibration will be calibrated according to the manufacturers' recommendations, where applicable. Frequency of instrument calibration will be dictated by the type of measurement device. The calibration frequency, calibration acceptance criteria, and the corrective actions required for out-of-calibration instruments will be obtained from the manuals for the equipment. Records of calibrations (both frequency and results) will be kept in the project-specific field log book. The information in the field log book will include (as appropriate): the make, model, and serial number of the instrument being calibrated; the type and/or concentration ("true value") of calibration standard used; the instrument span settings; the time, date, prevailing weather conditions, and name of the person performing the calibration; and any corrective action required for the instrument based upon calibration results.

Field equipment will be maintained in accordance with manufacturers' recommendations. Equipment failing to calibrate or otherwise malfunctioning will either be: returned to the rental equipment supplier and replaced with properly functioning (i.e., capable of proper use and calibration) equipment, repaired on-Site (repairs will be noted in the field logbook), or discarded.

If applicable, field equipment will be stored (when not in use) in a clean, controlled environment to prevent damage due to heat, cold, moisture, and dust. Reusable equipment will be decontaminated as soon as

reasonably possible after use and stored appropriately. Decontamination procedures for field sampling equipment are described in Section 2.5 of this SAP.

2.2 WATER LEVEL MEASUREMENTS

2.2.1 Groundwater Levels

Water level measurements will be collected from the wells listed in Table 1 of this SAP in November 2010 and in spring of 2011 (during the spring 2011 groundwater sampling event). The well locations are shown on Figure 3 of the RDWP. During the water level monitoring round, field personnel will measure water levels in the wells using battery-powered depth-to-water (DTW) meters. At each well, field personnel will measure the DTW to the nearest 0.01 foot using the surveyed point marked at the top of the inner well casing for reference. Measurements will be repeated at each well until two consecutive readings are within 0.01 foot. The meters will be thoroughly rinsed with deionized water prior to use in each well.

2.2.2 Surface Water Levels

Surface water levels from the on-Site intermittent stream will be measured in November 2010 and in spring of 2011 (during the spring 2011 groundwater sampling event). The stream monitoring points are shown on Figure 3 of the RDWP. The stream monitoring points will be installed as either staff gauges or steel pins depending on bedrock conditions, and surveyed in November 2010. Levels will be collected by reading the gauge or using a tape measure to measure the water surface distance from a surveyed reference point.

2.3 GROUNDWATER SAMPLING PROCEDURES

The groundwater monitoring program details (wells, sample frequency, and analytes) are provided in Tables 1 and 2 of this SAP. Locations of wells included in the RD groundwater monitoring program are shown on Figure 3 of the RDWP.

Groundwater samples for PW-3 and MW-2 will be collected from the sample taps (after purging the tap), in keeping with the current methodology. Groundwater samples from the other wells will be collected via 3-volume purge method, as described below. Water level measurements will be collected from wells prior to collecting the groundwater samples.

2.3.1 Groundwater Sampling Equipment

The following list presents equipment and documents that may be used in connection with evacuating and sampling the monitoring wells.

- This Remedial Design Sampling and Analysis Plan.
- Remedial Design/Draft Remedial Action Health and Safety Plan.
- Sample containers.
- Chain-of-Custody labels, tags, and traffic reports.
- Quality Assurance Samples (blanks).
- Log books and indelible ink markers, for recording information pertinent to the sampling procedures used, the location of the samples, and information on environmental conditions at the time of sampling.
- Meters, probes, and standards for field measurements.
- Decontamination solutions/water used for decontaminating equipment that comes in contact with groundwater.
- Buckets, plastic wash basins, and scrub brushes used for decontaminating the equipment.
- Electronic water level indicator and tape measure graduated in tenths and hundredths of feet, for groundwater level measurements.
- Tape measure graduated in tenths for stream level measurements.
- Pocket calculator for determining the volume of water within the well, which in turn, will be used for calculating the volume of water to be evacuated.
- Well evacuation equipment including a submersible pump to purge or evacuate stagnant water in the well prior to sampling.
- Bottom loading/bottom discharging poly or PVC bailers equipped with a stopcock will be used to obtain groundwater samples after the wells have been evacuated.
- Coolers.
- Ice or ice packs.
- Sealable plastic bags.
- Tap water, deionized water, and distilled and deionized water.

Sampling equipment may be modified if necessary based on Site

conditions at the time of sampling.

2.3.2 Well Evacuation

Prior to sample collection, the wells will be evacuated of three well volumes of water standing in the well casing. The calculation of the well volume will be conducted as follows.

- (1) Determine the static water level to the nearest one-hundredth of a foot below the top of casing.
- (2) Calculate the number of linear feet of static water (total depth of well minus the static water level).
- (3) Calculate the static volume in gallons using the following equation:

$$3 \times (\pi \times r^2 \times h \times 7.48 \text{ gallons/ft.}^3)$$
 where:

 $\pi = 3.14$

r = radius of casing in feet

h = linear feet of static water

All purge water will be containerized and disposed in the sanitary sewer system by emptying the purge water containers into the pit in the PW-3 pump room (discharge point for recovered on-Site groundwater).

A submersible pump, such as a whale pump or larger (e.g., stainless-steel Grundfos®) submersible pump, with poly or PVC tubing will be used to evacuate the wells. Pump size and placement will be dependent on well size and yields. Moderate to high well yields necessitate placement of the pump intake at the top of the water column. Low well yields require pump placement at the bottom of the well. Pump placement will be selected to attempt to ensure complete and proper evacuation. During purging, the discharge of the pump will be adjusted so that the water level does not fall below the top of the well screen. After the required volume of water is purged from the well, the groundwater sample will be collected, depending on the well, directly from the pump discharge into the laboratory-provided sample container or by utilizing a bottom loading/bottom discharging poly or PVC bailer. To minimize volatilization during sampling, the discharge of the pump will be reduced as low as possible.

2.3.3 Groundwater Sample Analysis

The samples will be submitted to the analytical laboratory, which is Lancaster Laboratories, Inc. (LLI), for analysis in accordance with the LLI QAPP and LLI Environmental Quality Policy Manual (EQPM), which are

respectively Attachments 2 and 3 to this SAP. Field measurements for pH, specific conductance, turbidity, dissolved oxygen, and temperature will be obtained on the groundwater collected immediately following sample collection. All measurement data will be recorded in the field log book(s).

2.3.4 Quality Assurance Samples

Procedures, frequency, and analysis for field quality control (QC) samples are identified in Section 8 of the QAPP (Attachment 1 to this SAP). Table 1 of this SAP also provides the QC sample frequency. Field quality control samples include trip blanks, equipment blanks, field duplicates, matrix spikes, matrix spike duplicates, and laboratory duplicate aliquots (laboratory duplicate aliquots to be as determined by laboratory).

2.4 SAMPLE LABELING, HANDLING, AND SHIPMENT

Samples will be collected and handled according to the appropriate analytical protocols for each matrix and analytical test. The types of containers, weights/volumes needed, and preservation techniques for the proposed testing parameters are presented in Table 2 of this SAP.

During sample collection, sample containers will be labeled with the following information:

- Site identifier and project name (NP2),
- sample location identifier and field quality control identifier (if applicable),
- sample type (grab) and media (groundwater) and identification code,
- analysis identifier,
- date and time of collection,
- type of preservative added (if applicable), and
- sample collector's initials.

All sample shipments to laboratories are expected to be exempt from the Resource Conservation Recovery Act (RCRA) and United States Department of Transportation (DOT) shipping regulations.

To ensure data of acceptable quality and samples that are representative, procedures to minimize sample degradation or contamination will be implemented. These procedures include preservation of the samples (as needed), as well as proper sample packaging and shipping. Sample bottles (preserved, if necessary), labels, and shipping containers, will be provided by the laboratory. Samples will be shipped within 24 hours of

collection, to the extent possible. Packing and shipping procedures for samples requiring chemical analysis are presented in Section 5.

2.5 DECONTAMINATION PROCEDURES

Decontamination procedures for sampling equipment are given below, but may be as otherwise approved by EPA. The purpose of these procedures is to ensure that cross-contamination of samples does not occur.

All non-disposable sampling equipment and supplies will be decontaminated prior to each use, in accordance with the following procedures.

- 1. Manual (i.e., scrub brush) scrub with a non-phosphate (e.g., Alconox) soap solution.
- 2. Tap water rinse to remove the soap solution.
- 3. 10% nitric acid rinse, such as trace metal or higher grade HNO₃ diluted with distilled and deionized water (required if analyzing for metals).
- 4. Distilled and deionized water rinse (required if analyzing for metals).
- 5. Acetone (pesticide grade) or methanol rinse (required if analyzing for organics).
- 6. Distilled and deionized water rinse.
- 7. Air dry.

The submersible pumps used for groundwater sampling will be decontaminated between wells by flushing with several gallons of non-phosphate (e.g., Alconox) soap solution and then several gallons of distilled or deionized water. The outside of the pumps and power cords will be thoroughly rinsed with distilled or deionized water. New discharge tubing will be used for each well.

Sampling equipment decontamination water will be disposed of in the on-Site groundwater recovery and discharge for treatment system.

2.6 MANAGEMENT OF INVESTIGATION DERIVED WASTE (IDW)

Solid IDW (other than trash) is not expected to be generated during the sampling. Liquid IDW such as sampling equipment decontamination water and well purge water will be generated during sampling. The liquid IDW will be disposed of into the pit in the PW-3 pump room.

Trash generated during sampling that has not been in contact with

contaminated materials and sampling equipment that has been decontaminated will be placed in garbage bags and placed in on-Site dumpsters or trash receptacles.

Trash generated during sampling that may have been contaminated (such as used PPE, emptied sample containers, polypropylene tubing, etc.) will be containerized appropriately (e.g., in 55-gallon DOT-approved drums). All such containers will be staged at well locations to await final disposition and will be labeled with "RD Residual Trash" and the generation date, using a permanent paint pen or grease pen. Alternatively and subject to Owner's approval, such trash may be placed in on-Site dumpsters or trash receptacles.

3.0 SAMPLE CUSTODY REQUIREMENTS

The possession and proper transfer of samples and sample-related information must be traceable from the time the samples are collected until the data have been received. The following subsections summarize the general aspects of custody and how they will be applied and managed during the course of the project. A sample or sample-related information (sample or evidence file) is under an individual's custody if it:

- is in the individual's possession;
- is in the individual's view, after being in the individual's possession;
- is in the individual's possession and the individual places the samples and/or sample information in a secure location; or
- is in a secure, designated place.

3.1 CHAIN-OF-CUSTODY PROCEDURES

The sample packaging and shipment procedures summarized below and in Section 5 will ensure that all samples arrive at the laboratory with the chain-of-custody intact.

When transferring the possession of samples, the individuals relinquishing and receiving the samples will, respectively, sign, date, and note the time on the chain of custody. Additional sample handling and custody procedures to ensure sample integrity are presented in Sections 3.2 and 3.3 below.

Whenever samples are split with another source (e.g., a government agency), a separate sample receipt will be prepared for those samples and marked to indicate with whom the samples are being split. The person relinquishing the samples to the facility or agency should request the representative's signature acknowledging sample receipt. If the representative is unavailable or refuses to sign, this should be noted in the "Received By" space.

3.2 FIELD CUSTODY PROCEDURES

Field procedures to ensure sample integrity are implemented between sample collection and courier pickup/delivery to the express service, as follows.

- The field sampler is responsible for the care and custody of the samples until they are transferred or properly dispatched. As few people as possible should handle the samples.
- All bottles will be labeled with the appropriate sample numbers and locations.
- Sample labels are to be completed for each sample using waterproof ink unless infeasible because of weather conditions.
- The Quality Assurance (QA) Officer or designee will review the field activities to ensure that proper custody procedures were followed during the field work.

3.3 LABORATORY CHAIN-OF-CUSTODY PROCEDURES

Laboratory custody procedures for sample receiving and log-in, sample storage, tracking during sample preparation and analysis, and storage of data will be described in the Laboratory QAPP (Attachment 2 to this SAP). All laboratory handling and custody procedures must conform to EPA requirements. A brief summary of the required laboratory custody and sample handling procedures is presented below.

The laboratory's quality assurance officer or designee will ensure that the chain-of-custody records are signed by the laboratory's representative upon receipt of the samples, including any necessary observations concerning sample integrity or temperature. The laboratory's quality assurance officer will also ensure that sample-tracking records are maintained. These records will follow each sample through all stages of laboratory processing. The sample tracking records must show the date of sample extraction or preparation and the date of instrument analysis. These records will be used, in part, to determine compliance with holding time requirements.

4.0 FIELD LOGBOOKS/DOCUMENTATION

Field logbooks will be used to document data collection activities performed in the field. Entries will contain sufficient detail, including sketches when necessary, to reconstruct a particular situation without reliance on memory. Pertinent data collected during sampling will be maintained using bound field log books. However, separate groundwater sample log sheets may be used to record the relevant sampling information for each well. Each page will be numbered, dated, and signed by the person making the entry. All entries will be made in ink. Errors will be crossed out with a single line, initialed, and dated. At the completion of the day, if a page is not complete, a diagonal line will be drawn through the remainder of the page, with the signature at the bottom.

Pertinent information to be supplied in the field logbook for each sampling event is listed below:

- name and location of investigation;
- date and time of arrival and departure;
- names and affiliations of personnel on-Site during sampling, or accompanying the sampling team on the premises of others;
- purpose of the Site visit;
- field instruments used, date and time of calibration and calibration checks, method of calibration, standards used;
- field measurement results;
- date, time, and location of the sampling points;
- method of sample collection;
- any factors that could affect sample integrity;
- name of sampler(s);
- sample identification and sample description, including qualitative observations of sample color, turbidity, and/or odor;

 pertinent details of interactions with the client, site or agency/oversight personnel, including any field decisions and scope change approvals; and

• weather conditions.

5.0

The following procedures, or as otherwise required by the laboratory, will be used for sample shipment.

- 1. Mark cooler(s) for shipment.
 - Affix "This Side Up" arrow labels and "Fragile" labels on each cooler and
 - Place mailing label with laboratory address on top of cooler(s).
- 2. Ensure that all sample containers are correctly labeled.
- 3. Enclose sample containers in closed plastic zip-lock bags to prevent spillage in the event of container breakage in transit.
- 4. Place cushioning material at the bottom of the cooler to protect the sample containers.
- 5. Arrange containers in the cooler so that they are not in direct contact with the cooler or other samples, to minimize breakage.
- 6. Fill remaining spaces between the sample containers with packing material.
- 7. Ensure all containers are firmly packed in packing material.
- 8. If ice is required to preserve the samples, repackage ice cubes in double zip-lock bags and place them on top of the packing material, rather than in direct contact with the sample containers.
- 9. Check that the chain-of-custody form was signed and completed properly (sample number, location, analytes to be tested, and number of sample containers, plus remarks on concentrations, if known). Indicate the time and date it was relinquished to Federal Express or other carrier, as appropriate.
- 10. Separate copies of chain-of-custody forms. Seal copies for laboratory within a large zip-lock bag and place inside lid of cooler. Retain copies of all forms.
- 11. Close lid and latch.
- 12. Secure each cooler using custody seals on front and rear of cooler.

- 13. Tape over custody seals on each end of the cooler with clear, sturdy parcel tape. Continue taping around the cooler from the front, across the top, down the back, across the bottom, and up the front on each end of the cooler so that the cooler is securely sealed.
- 14. Relinquish to Federal Express or other courier service (e.g., laboratory driver) as appropriate. Retain airbill receipt for project records.
- 15. Telephone or e-mail the laboratory contact and provide them with the following shipment information:
 - sampler's name,
 - project name,
 - number of samples sent and requested turn-around-time, and
 - airbill number.

If the samples are sent by common carrier, a bill of lading (airbill) must be used. Receipts of bills of lading will be retained as part of the permanent documentation. Commercial carriers are not required to sign the custody form as long as the custody forms are sealed inside or on the outside of the sample cooler and the custody seals remain intact.

DATA REVIEW AND VALIDATION

6.0

The groundwater sample data will be reviewed and validated in accordance with the QAPP (Attachment 1 to this SAP). Any data usability issues identified in the QA non-conformance summaries or noted during the analytical review (e.g., analytical detection limits higher than corresponding applicable standard) will be reported to EPA.

7.0 DATA REPORTING

Data generated from laboratory analyses will be entered into a database as necessary to facilitate data review and evaluation. The data will be reported to EPA in accordance with the reporting requirements of the Administrative Settlement Agreement and Order on Consent for Remedial Design. The data will be available for controlled access by authorized personnel and incorporated into reports as needed.

Tables

Table 1
Summary of Groundwater Samples to be Collected
Remedial Design Sampling and Analysis Plan
North Penn Area 2 Superfund Site
Hatfield Township, Pennsylvania

Sampling Locations	Total Number of Samples	Frequency of Trip Blanks	Frequency of Equipment Blanks	Frequency of Field Duplicates	Frequency of MS/MSD Pairs
Monitoring wells		1 per cooler	1 per 20	1 per 20	1 per 20
(listed below)	41 *	of samples	samples	samples	samples
′ MW-1	·	for VOCs	,		
MW-1I			·		
MW-1D		•			
MW-2					
MW-2I		·			
MW-2D					·
MW-3A					
MW-3B		•	•		
MW-3C					
MW-3D			·		
MW-4S					
MW-4D					
MW-5					
MW-5I					
MW-5D			•		
MW-5XD					
MW-6 *				_	
MW-7					
MW-8S					
MW-8D					
MW-9S				•	
MW-91					
MW-9D			!		ľ
MW-10S		•			
MW-10I					
MW-10D					
MW-11A					
MW-11B	!				
MW-116 MW-11C					· ·
MW-12A			.		
MW-12B		·			.
MW-13S					
MW-13I					
MW-13D	,	•			
MW-14S		-			
MW-145 MW-14I	ŀ		'		
MW-14D					}
PCGW-2	,				[
PCGW-3			.		·
PW-1					
PW-2					}
PW-3			,		
M-6 **					L

Note:

^{*} MW-6 may need to be replaced. It will be sampled if possible, in which case the total number of samples will be 42.

^{**} EPA reported in 2010 that its subcontractor had observed that M-6 was removed. It will not be sampled during the RD unless it is replaced as a result of capture zone analysis results.

Table 2
Groundwater Sample Requirements
Remedial Design Sampling and Analysis Plan
North Penn Area 2 Superfund Site
Hatfield Township, Pennsylvania

Contaminant of Concern	Cleanup Level (µg/L)	Analytical Method	Limit of Quantitation, LOQ (µg/L)	Method Detection Limit, MDL (µg/L)	Sample Size/ Container	Preservation	Holding Time
Carbon Tetrachloride 5		SW-846 8260B	5	1			
1,2-Dichloroethane 5		SW-846 8260B	5 .	1			ļ
Cis-1,2-Dichloroethene	70	SW-846 8260B	5	0.8	3 x 40 mL glass		
1,1-Dichloroethene	7	SW-846 8260B	5	0.8	vial with teflon- HCL, Cool 4°C		14 days
Tetrachloroethene (PCE) 5		SW-846 8260B	5	0.8	lined cap		
Trichloroethene (TCE)	5 -	SW-846 8260B	5	1			
Vinyl Chloride	. 2	SW-846 8260B	5	1			`
Antimony	6	SW-846 6020	- 1	0.3			
Arsenic 10		SW-846 6020	2	0.95	500 I li	HNO, Cool 4°C	(Mantha
Manganese	217	SW-846 6010B	5	0.84	500 mL plastic HNO ₃ , Cool 4°C		6 Months
Thallium	0.5	SW-846 6020	0.5	0.15			
					1000 mL amber	6 1406	7 days/40
1,4-Dioxane	6.1	SW-846 8270C	5	1	glass	Cool 4°C	days

Notes

^{1.} Lancaster Labs' reporting limit is denoted as Limit of Quantitation (LOQ). When the LOQ is greater than the corresponding groundwater cleanup level, the MDL will be used for comparison against the groundwater cleanup level.

^{2.} Bolded and shaded cells indicate that the reporting limit (LOQ) is greater than the groundwater cleanup level and the MDL will be used.

Attachments

Attachment 1 Quality Assurance Project Plan

AMETEK, Inc. and Penn Color, Inc.

Remedial Design Quality Assurance Project Plan

North Penn Area 2 Superfund Site Hatfield Township, Pennsylvania

12 November 2010

0042525

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TABLE 1 DATA QUALITY OBJECTIVES

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been developed for Remedial Design (RD) sampling at the North Penn Area 2 Superfund Site (Site) in Hatfield Township, Pennsylvania. This QAPP is an attachment to the Remedial Design Sampling and Analysis Plan (SAP), which is an appendix to the Remedial Design Work Plan (RDWP). This QAPP includes specific procedures for proper documentation of sampling procedures, field measurements, and sample analyses to produce legally defensible groundwater monitoring data. This QAPP has been prepared using general guidance presented in the United States Environmental Protection Agency (EPA) document titled EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5 (EPA/240/B-01/003, March 2001, reissued May 2006). As described in the EPA document, this QAPP-is based on a "graded approach" so that the level of detail of the required activities is commensurate with the nature of the work being performed and the intended use of the data.

1.1 SAMPLING PROGRAM OBJECTIVES

The principal objectives of the RD groundwater monitoring program are to obtain current information and to provide data for use in the capture zone analysis that will be performed as part of the remedial design, in particular to aid in determining the extent of groundwater capture at the southern end of the study area.

1.2 PROJECT TEAM ORGANIZATION

The project team for the RD groundwater monitoring program is described below. The personnel listed below, as well as other personnel as needed, will be provided this QAPP.

The Project Coordinator is Mr. Rich Dulcey, P.E. of Environmental Resources Management, Inc. (ERM). The Project Coordinator will be the lead contact for project correspondence and discussions between the Settling Defendants, EPA, and other involved parties.

Mr. (b) (4) E.I.T., of ERM will serve as the Project Manager and will assist the Project Coordinator. The Project Manager will be responsible for ensuring overall project quality and providing technical support to the Project Coordinator and will coordinate the RD groundwater monitoring

program. The Project Manager will be responsible for managing subcontractors and supervising and coordinating field operations, the quality assurance (QA) program, data analysis, report preparation, and any necessary meetings. The Project Manager will ensure that the QAPP is distributed to the project team and other recipients, as needed.

Mr. (b) (4) , Ph.D. of ERM and Ms. (b) (4) of ERM will share the role of project QA Officer (QAO) for the RD groundwater monitoring program and maintenance of the QAPP. The QAO will assist in ensuring proper execution of project analyses, designing of the analytical QA program and protocols, validating sample analytical data, and performing QA audits as needed.

Mr. (b) (4) , or other, will serve as Field Manager. The Field Manager will be responsible for overseeing field activities, procuring necessary field equipment and supplies, compliance with the provisions of the QAPP, and coordination between the field team and the Project Manager. The Field Manager and the sampling staff will be responsible for collection of field data and assisting in the compilation of the collected data into readily understandable maps, tables, and figures, as deemed necessary by the Project Manager.

The analytical laboratory for this project is Lancaster Laboratories, Inc. (LLI) of Lancaster, PA. The LLI quality assurance personnel will be responsible for maintenance of all laboratory QA activities for the project.

2.0 GROUNDWATER SAMPLING PROGRAM DESCRIPTION

2.1 SCOPE

The RD groundwater sampling program consists of a single round of groundwater sampling from the Site wells in spring of 2011. The wells are listed on Table 1 of the SAP. The well locations are shown on Figure 3 of the RDWP.

2.2 SAMPLING PARAMETERS

2.2.1 Field Parameters - Groundwater

The following field parameters will be monitored during groundwater sampling: temperature, pH, dissolved oxygen, turbidity, and specific conductance. During each round of groundwater sampling, well depth will be measured. Procedures for measurement of water level and other groundwater parameters will be according to the SAP and the instrument manufacturer's specifications.

2.2.2 Laboratory Analysis - Groundwater

Groundwater samples collected from the monitoring wells will be analyzed for the parameters listed in Table 2 of the SAP.

Table 1 of the SAP summarizes the anticipated number of groundwater samples and the frequency of QC samples to be collected. The sample parameters, analytical methods, container requirements, preservatives, and holding times are presented in Table 2 of the SAP.

2.3 SAMPLING EQUIPMENT DECONTAMINATION

The sampling equipment decontamination procedures are described in the SAP.

2.4 SAMPLING EQUIPMENT AND PROCEDURES

Groundwater samples will be collected using a 3-well-volume purge method as described in the SAP. Groundwater samples for PW-3 and MW-2 will be collected from the sample taps (after purging the tap), in keeping with the current methodology.

Each groundwater sample to be analyzed for the volatile organic compounds (VOCs; see Table 2 of the SAP) will be collected in a laboratory-provided 40-milliliter (mL) septum vial with a screw cap and a Teflon-silicone septum disk in the cap. The disks will be placed in the caps with the Teflon side in contact with the sample. To minimize potential volatile contamination of the vials, sampling personnel will keep the vials capped until immediately before sampling. Upon sampling, the vial will be filled to zero headspace and immediately capped. Three 40-mL vials (with laboratory-provided preservative) will be collected for each sample.

Each groundwater sample to be analyzed for antimony, arsenic, manganese, and thallium will-be collected in one laboratory-provided 500-mL plastic container.

Each groundwater sample to be analyzed for 1,4-dioxane will be collected in one laboratory-provided 1,000-mL amber glass container.

These samples will be promptly placed on ice and stored at 4°C. Groundwater samples will be analyzed at the laboratory for the parameters specified in Table 2 of the SAP.

The samples collected represent the quality of groundwater in the vicinity of each well sampled, for the time period in which sampling was conducted.

2.5 FIELD QC SAMPLES

In addition to the collection of groundwater samples for analysis, field QC blank samples and duplicates to be used as internal QC checks will be collected according to the frequency of one trip blank per cooler of VOCs, and one equipment blank, blind duplicate, and MS and MSD pair per 20 samples. These frequencies are provided on Table 1 of the SAP. The following summaries describe the field QC samples to be collected, and their usage.

2.5.1 Trip Blank

A trip blank is a sample container filled in the laboratory with organic-free water and that travels unopened with the unused sample containers to the site. It is returned with each cooler of samples to the laboratory, where it

is unsealed and analyzed along with the other samples for volatile organic constituents. The trip blank is used to indicate whether contamination of the samples has occurred during container shipment to the site, sampling, or sample transport back to the laboratory. A temperature blank will also be included in each cooler to ensure that the sample preservation temperature of 4°C is maintained.

2.5.2 Equipment Blank

An equipment blank is made by taking organic-free distilled water and placing it in contact with the field sampling equipment (e.g. pump or bailer internals) that has contacted the groundwater being sampled. The water is then placed in the same type of sample container as the other samples, preserved in the same manner, transported to the laboratory with other samples, and analyzed for the parameters of interest.

Equipment blanks are used to monitor the effectiveness of field cleaning procedures. However, contamination detected in equipment blanks may be due to factors other than inadequate field cleaning techniques. Other sources of potential contamination may include the chemical preservatives and sample containers used during the investigation, as well as laboratory and transport sample handling procedures. Trip blank results can therefore be used to confirm whether any compounds detected in the equipment blank are from inadequate cleaning.

2.5.3 Field Duplicate

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A field duplicate is a pair of replicate samples collected at the same sampling location, at the same time, in the same manner, preserved in the same way, and analyzed by the laboratory using the same method. The field duplicate results are used to evaluate the sampling and analytical precision.

2.5.4 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Two duplicate samples are collected from a given groundwater sampling location and submitted to the laboratory with the other groundwater samples. The laboratory adds a known concentration of analytes to each sample and analyzes the concentration in each. The results are then used to assess data precision and accuracy.

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2.6 AIR MONITORING

Air monitoring will be conducted to evaluate air quality during well opening, gauging, and purging activities. The data obtained will be used to determine the appropriate control actions and personal protective equipment (PPE) requirements, as per the Health and Safety Plan (HASP) for the sampling program.

A photoionization detector (PID) will be used to screen the well head for organic vapors. The PID will be equipped with a 10.6 eV lamp and calibrated with isobutylene. PID operation procedures will be as specified by the instrument manufacturer. PID readings for the well head will be recorded in the field logbook. The PID will also be used to monitor the breathing zone during groundwater sampling activities. PID action levels and response actions will be in accordance with the HASP.

2.7 FIELD DATA DOCUMENTATION/FIELD LOGS

Field logbooks will be used to document data collection activities performed in the field. Entries will contain sufficient detail, including sketches when necessary, to reconstruct a particular situation without reliance on memory. Pertinent data collected during sampling will be maintained using bound field log books. However, separate groundwater sample log sheets may be used to record the relevant sampling information for each well. Each page will be numbered, dated, and signed by the person making the entry. All entries will be made in ink. Errors will be crossed out with a single line, initialed, and dated. At the completion of the day, if a page is not complete, a diagonal line will be drawn through the remainder of the page, with the signature at the bottom.

Pertinent information to be supplied in the field logbook for each sampling event is listed below:

- name and location of investigation;
- date and time of arrival and departure;
- names and affiliations of personnel on-Site during sampling, or accompanying the sampling team on the premises of others;
- purpose of the Site visit;
- field instruments used, date and time of calibration and calibration checks, method of calibration, standards used;
- field measurement results;

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- date, time, and location of the sampling points;
- method of sample collection;
- any factors that could affect sample integrity;
- name of sampler(s);
- sample identification and sample description, including qualitative observations of sample color, turbidity, and/or odor;
- pertinent details of interactions with the client, site or agency/oversight personnel, including any field decisions and scope change approvals; and
- weather conditions.

3.1 OVERALL PROJECT DATA QUALITY

The overall data quality objective (DQO) for the chemical analysis of groundwater samples is to provide data of sufficient quality to characterize groundwater with respect to the groundwater cleanup standards. To meet this DQO, definitive quantitation from an off-site laboratory is needed on 100 percent of the samples. If a particular sample is compromised (e.g., broken, lost, etc.) or consumed without useable data generated, a new sample will be collected and submitted for analysis.

The analytical methods and associated quantitation limits are compared against the groundwater cleanup standards in Table 2 of the SAP. The proposed methods provide reporting limits that are sufficiently low to facilitate a comparison to the groundwater cleanup standards. Lancaster Labs' reporting limit is denoted as Limit of Quantitation (LOQ). Parameters for which the laboratory LOQ is greater than the corresponding groundwater cleanup standard, the laboratory Method Detection Limit (MDL) will be used for comparison against the groundwater cleanup standard (see Table 2 of the SAP).

This section of the QAPP further defines project DQOs in terms of precision, accuracy, representativeness, comparability, and completeness. General guidelines for data precision, accuracy, and completeness have been established for both field and laboratory measurements, as summarized in Table 1 of this QAPP.

3.2 PRECISION, ACCURACY, REPRESENTATIVENESS, COMPARABILITY, AND COMPLETENESS

3.2.1 Precision

Precision is defined as an estimate of the reproducibility of a method and/or collection procedure and thus is a measure of sample result variability. It will be evaluated with field duplicate samples, laboratory duplicate samples, MS/MSD samples, and laboratory calibration data. Precision will be calculated as the relative percent difference (RPD), percent relative standard deviation (%RSD), or percent difference (%D), whichever is applicable to the type of QC samples involved.

3.2.2 Accuracy

The accuracy of a method is an estimate of the difference between the true value and the determined mean value. The term "accuracy" includes measures of bias (i.e., underreporting or overreporting of measured concentrations). Accuracy will be evaluated through MS samples, laboratory control samples, and surrogate recovery data, and laboratory calibration data, and it will be presented as percent recovery (%R). These data reflect biases in the analytical results. Blank samples are used to demonstrate both the accuracy of identification of detected compounds and the accuracy of the reported sample results.

3.2.3 Representativeness

Samples collected during field activities associated with the groundwater monitoring program are to be representative of the population from which they were collected. Representativeness is defined as the degree with which the data collected accurately and precisely characterize a population, a parameter of interest, variations at a sampling point, a process, or an environmental condition.

Representativeness of specific samples will be achieved using the following:

- appropriate sample number and location selection to adequately characterize current groundwater conditions;
- appropriate sampling procedures and equipment;
- appropriate selection of analytical methods that meet required reporting limits for assessment of DQOs;
- appropriate selection of analytical parameters;
- collection of the appropriate number of QA/QC samples to statistically verify proper functioning of analytical equipment;
- appropriate documentation of sampling and analysis activities and sampling locations using field logs, chain-of-custody forms, and laboratory books that are signed and dated by sampling or analysis personnel; and,
- proper sample preparation in the field and the laboratory.

3.2.4 Comparability

Comparability, as used within this QAPP, is the degree of confidence with which one data set can be compared to another. To ensure data set

comparability, the following steps will be taken:

- figures showing sampling locations will be consistent with the actual sampling locations;
- chemical parameters will be analyzed according to USEPAapproved methods;
- techniques used to collect samples will be standardized in accordance with USEPA guidance;
- standardized units will be used to report field and laboratory analytical results; and
- the level of QA/QC will be defined based upon standardized criteria.

3.2.5 *Completeness*

Data completeness is defined both as the percentage of total tests conducted that are deemed valid and also as the percentage of the total tests required in the scope of work that are deemed valid. Specific criteria for data completeness are presented in Table 1 of this QAPP.

$$%C = \frac{V}{n} \times 100$$

Completeness:

%C₌ percent completeness

V = number of measurements judged valid

n = total number of measurements necessary to achieve a specified statistical level of confidence in decision making

3.3 SPECIFIC METHODS FOR ASSESSMENT OF DQOs

3.3.1 Field DQOs

Field quality control (QC) sample analysis enables the distinction to be made between laboratory, sampling technique, and sample matrix variability sources of error. Field QC samples (trip blanks, field duplicates, equipment blanks, and MS/MSD pairs) will be collected to help assess whether the data obtained are accurate and precise. Table 1 of

the SAP presents the frequency with which field QC samples will be collected, and Table 1 of this QAPP indicates the DQO assessed through each type of field QC sample and what control limit applies to that QC sample.

Analytical data for trip blanks and equipment blanks provide a check on accuracy. Although blanks do not monitor analyte losses, they do provide information on contaminants introduced during sample collection, preservation, handling, shipping, or analysis. The DQO for trip blanks and equipment blanks is to meet or exceed the method reporting limit. In the event that the blanks are contaminated and/or poor field duplicate precision is obtained, the associated data will be qualified as described in Section 8.0 of this QAPP.

Representativeness of samples will be maintained throughout the sampling program by following-EPA-recommended procedures for sample collection, preservation, and holding times.

The completeness of the field data will be assessed by evaluating the sample analysis documentation and the degree of adherence to specified standards for parameter measurement. The impact (if any) of any uncollected data on project objectives will be evaluated by the Project Manager. Corrective actions will be initiated, as needed, to address any data gaps that occur.

To establish sufficient comparability that data generated in this sampling program can be directly compared with historical data, standardized field and laboratory analysis, sample collection, holding time, and preservation methods will be used. In addition, field observations of sample characteristics will be considered in evaluating data comparability.

3.3.2 Laboratory DQOs

Information concerning laboratory accuracy, precision, representativeness, and completeness will be assessed through the analysis of laboratory and field QC samples, and laboratory calibration standards. Surrogate recovery data and laboratory method blanks will also demonstrate accuracy and precision with respect to the analyses.

The analytical laboratory will be expected to process an aliquot of sample such that the analytical results provide a high degree of representativeness with respect to the sampling point. In addition, the analytical laboratory will be expected to document any analytical problems encountered during the course of the project. Communication will be maintained between the laboratory and the project manager, so

that analytical problems encountered for critical sample points will be identified in time to allow these samples to be re-collected, if necessary. Further, the laboratory will provide all data packages in a Contract Laboratory Program (CLP)-equivalent format to ensure that analytical methods, parameters, and reporting units are compatible throughout the investigation.

3.4 LABORATORY REPORTING LIMITS

The laboratory will be expected (as an ideal objective) to report the required reporting limits for all samples in the appropriate reporting units for all analyses, as presented in Table 2 of the SAP. However, it should be noted that these limits are sample specific and depend on variables such as dilution factors, sample matrices, and the specific analyte. Evaluation of the data reported at or near the analytical reporting limit will consider the fact that accuracy and precision are reduced for such data.

As stated in Section 3.1 above, the proposed methods provide reporting limits that are sufficiently low to facilitate a comparison to the groundwater cleanup standards. Lancaster Labs' reporting limit is denoted as LOQ. Parameters for which the laboratory LOQ is greater than the corresponding groundwater cleanup standard, the laboratory MDL will be used for comparison against the groundwater cleanup standard (see Table 2 of the SAP).

3.5 DATA MANAGEMENT OBJECTIVES

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The overall data management objective is to provide a complete data base. This is accomplished by minimizing manual data entry/re-entry, ensuring consistent units, and spot checks of linked laboratory and field data to ensure that such data have been correctly associated with each other.

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4.0 SAMPLE CUSTODY

Sample custody procedures and requirements are provided in the SAP.

5.1 FIELD INSTRUMENTATION

Calibration of the PID for organic vapor analysis will be performed in accordance with the PID manufacturer's operating manual. Field equipment for organic vapor screening will be calibrated at a frequency of once per day.

Calibration of the water quality sampler (e.g., sampler for pH, temperature, etc.), using appropriate known reference standards in accordance with the manufacturer's instructions, will be conducted once per sample event or once per week, whichever is more frequent.

5.2 LABORATORY INSTRUMENTATION

Laboratory calibration procedures (including frequency, and standards) will be conducted in accordance with procedures stated in LLI's Laboratory Quality Assurance Project Plan (QAPP) and Environmental Quality Policy Manual (EQPM) (Attachments 2 and 3 to the SAP, respectively).

ANALYTICAL PROCEDURES

6.0

The analytical procedures to be used for the project are EPA-approved methods. The analytes, analytical methods, reporting limits, containers, preservatives, and holding times are presented in Table 2 of the SAP. The Laboratory QAPP and EQPM (Attachments 2 and 3 to the SAP, respectively) provide additional information about the analytical procedures.

7.0 QC CHECKS

7.1 FIELD QC CHECKS

Field blanks, trip blanks, and equipment blanks will be prepared as described in Section 2.5 at the frequencies given in Table 1 of the SAP and analyzed at the laboratory for the compounds listed in Table 2 of the SAP. These blank results will be used in data validation to assess the accuracy of the groundwater sample results.

7.2 LABORATORY QC CHECKS

The types and frequencies of the laboratory internal QC checks are described in the Laboratory QAPP (Attachment 2 of the SAP) and will be used by the laboratory to demonstrate its ability to produce acceptable analytical results.

The MS/MSD samples and field duplicates will be collected in the field (see Section 2.5) at the frequencies given in Table 1 of the SAP and analyzed at the laboratory for the compounds listed in Table 1 of the SAP.

8.0 DATA VALIDATION AND REPORTING

Data validation procedures include an evaluation of both the field data and the laboratory analytical data package. The following discussions address data review, reduction, validation, and reporting.

8.1 FIELD DATA

The field data will be reviewed to ensure adequate documentation of field analyses and sampling activities. During review of the data, the following items will be checked by either the Quality Assurance Officer or the Project Manager to verify the following:

- equipment blanks and trip blanks were properly prepared, identified, and analyzed;
- field analyses, equipment calibration, and field observations are included; and
- chain-of-custody forms are properly completed, with signatures of field personnel and the laboratory sample custodian.

8.2 LABORATORY DATA REPORTING

Data packages associated with sample analyses from the investigation will be prepared using EPA CLP-equivalent deliverable format. Analytical data for aqueous matrices will be reported in micrograms per liter ($\mu g/l$) for all parameters.

Data from field instrument analyses will be summarized by personnel designated by the Project Manager. Analytical data will also be tabulated and formatted upon electronic receipt from the laboratory. Upon receipt of the data packages, the laboratory data will be validated and qualified as described in the next section.

8.3 LABORATORY DATA VALIDATION

After receipt of the sample data packages, the laboratory data will be quantitatively and qualitatively validated by the Quality Assurance Officer or designee. The validation steps will be performed in accordance with "Region III Innovative Approaches to Data Validation" (EPA Region III;

September 1994). The guidance includes validation checklists, calculations, and forms.

The analytical data package validation procedure will include a review of the following:

- sampling and analysis dates, to check that samples were analyzed within proper holding times;
- analytical methods and required reporting limits (as specified in Table 2 of the SAP), to verify agreement with those stated in Table 2 of the SAP;
- field and laboratory blanks, to evaluate possible contamination sources (the preparation techniques and frequencies and the analytical results, if appropriate, will-be considered);
- field duplicates, to check the precision of chemical analyses and field sample collection techniques;
- surrogate spikes, to be within allowable control limits specified for the method;
- MS recoveries (considered advisory by the EPA), to evaluate the presence of matrix interferences that may have affected recovery of a particular analyte; and
- MSDs, to review the relative percent difference calculated and reported by the laboratory along with the RPD control limits.

8.4 DATA VALIDATION REPORT

Following review of the laboratory analytical data package, the Quality Assurance Officer or designee will prepare a summary report, describing any QA/QC outliers or concerns and their possible impact on the analytical results. Summary tables presenting the validated sample data, with data validation qualifier flags, will be included as an attachment to the data validation report. Future users of the validated data are to maintain these data validation flags with any subsequent use of the data. The validated data will be submitted to the Project Manager for use in the final project report.

RECORDS RETENTION

8.5

Hard copy information (e.g. field logbooks, laboratory reports, data validation reports) will be either retained in the project files under the control of the Project Manager or Quality Assurance Officer, or electronically cataloged (for subsequent efficient retrieval) and archived for the time period required by the Consent Decree for the Site. Electronic data deliverable records on compact disc will be retained with the corresponding hard-copy files.

9.0 PERFORMANCE AND SYSTEM AUDIT

Performance and system audits for sampling and analysis operations will consist of an on-site field review. The field system audit includes review of field QA systems and equipment for sampling, calibration, and measurement.

A laboratory system audit will not be performed for the RD groundwater sampling since it is a single sampling event.

9.1 FIELD SYSTEM AUDIT

The Project Manager, or qualified designee, will make one unscheduled visit to the project site to observe the performance of the field operations team during field activities. Findings of field system audits conducted by personnel other than the Project Manager will be reported to the Project Manager.

10.0

Field equipment that requires preventive maintenance will be serviced as described in the manufacturer's manual for each instrument or as otherwise necessary. Records of preventative maintenance activities for field equipment, if necessary, will be documented in the field logbook. Laboratory instrumentation will be serviced as stated in the Laboratory QAPP (Attachment 2 to the SAP). Records of calibration and maintenance activities for each piece of laboratory equipment will be maintained by the laboratory as stated in the Laboratory QAPP (Attachment 2 to the SAP).

11.0 CORRECTIVE ACTION

During the course of the project, the Field Manager will be responsible for ensuring that field instruments are functioning properly and that work progresses satisfactorily. Proper equipment function is assessed through satisfactory calibration (see Section 5 of this QAPP) of the equipment. Faulty equipment would be replaced upon its discovery. The Field Manager is also responsible for the performance of routine preventive maintenance and field QC procedures, thereby ensuring collection of valid field data. The laboratory has similar preventive maintenance and QC procedures to follow that are described in the Laboratory QAPP (Attachment 2 of the SAP).

If a problem is detected by the Field Manager, the Project Manager will be notified promptly, at which time the problem will be further investigated, and any necessary corrective action will begin.

Corrective actions for the laboratory are presented in the Laboratory QAPP (Attachment 2 of the SAP). The laboratory will provide documentation as to what, if any, corrective actions were initiated concerning the project and report them to the Project Manager.

Any laboratory or field deficiencies that are found to affect data quality or achievement of the DQOs will be reported with the validated data submittal prepared for each quarterly sampling event.

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12.0 REPORTS TO MANAGEMENT

Results of field or laboratory audits reported to the Project Manager will be transmitted to the Project Officer and, as requested, the Project Coordinator along with recommendations for corrective action and results, or confirmation, of the corrective action.

The data validation report (see Section 8.4 of this QAPP) will constitute the project QA report. This report will be transmitted as necessary in accordance with the reporting requirements of the Consent Decree.

Table 1
Data Quality Objectives
Remedial Design Quality Assurance Project Plan
North Penn Area 2 Superfund Site
Hatfield Township, Pennsylvania

Data Quality Objective	QA/QC Parameter	Aqueous Control Limit	
	Field Duplicates	≥20% RPD	
Precision	Matrix Spike Duplicates	Lab QC	
	Instrument Calibration	Method QC	
	Instrument Calibration and Internal Standards	Method QC	
Accuracy	Laboratory Control Samples	Lab QC	
recurucy	Matrix and Surrogate Spikes	Lab QC	
	Lab, Trip, and Equipment Blanks	< RL	
Completeness	Field Sample Collection	95%	
	Sample Analysis	95%	

Notes

RPD = Relative Percent Difference Lab QC = Laboratory QC Limits RL = Method Reporting Limit Attachments 2 and 3 [Provided on disc only]

Laboratory Quality Assurance Project Plan (Lancaster Labs)

Environmental Quality Policy Manual (Lancaster Labs)

SEMS-RM US EPA Region III Imagery Insert Form

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	Site DSN: PA-2031	Site Status: NPL	Releasability:	REL				
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